IEEE P802.11
Wireless LANs

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| [Negotiating LTF Repetitions](relative to IEEE REVmd D1.0, 802.11ax D3.0 and 802.11az D0.6) |
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Abstract

This submission is a specification text proposal in order to support negotiation of the number of LTF repetitions to be used in uplink and downlink NDP frames exchanged as part of the non-Trigger or Trigger based ranging exchange. Submission <TBD> provides motivation and overview of the proposal.

History:

R0: Initial Version; The Number of Antennas subfield is being refined; and will be addressed in a different submission. UL Rep and DL Rep setting corresponding to the negotiated RSTA Assigned Max UL Rep and RSTA Asssigned Max DL Rep to Secure TB and Secure non-TB Measurement Exchange 11.22.6.4.6 will be in a different submission.

**9.3.1.19 VHT/HE/Ranging NDP Announcement frame format**

*TGaz Editor: Update the description of the DL Rep and UL Rep subfields as shown below:*

The DL Rep and UL Rep subfields indicate the number of repetitions N\_REP of the HE-LTF symbols of the corresponding HE Ranging NDP PPDU beyond the number of space-time streams, see subclause 28.3.17.

Note: For non-secure ranging, the UL Rep is set to a value no greater than the negotiated RSTA Assigned UL Rep; and DL Rep is set to a value no greater than the negotiated RSTA Assigned DL Rep (See 11.22.6.3 Fine Timing Measurement procedure negotiation). For secure ranging, the UL Rep is set to the negotiated RSTA Assigned UL Rep; and DL Rep is set to the negotiated RSTA Assigned DL Rep (See 11.22.6.3 Fine Timing Measurement procedure negotiation).

### 9.3.1.23.9.2 Sounding sub-variant

*TGaz Editor: Modify the following paragraph in Cl. 9.3.1.23.9.2 as shown below:*

The UL Rep subfield signals the number of repetitions N\_REP of the HE LTF symbols in the corresponding HE TB Ranging NDP PPDU from the STA indicated in the AID12/RID12 subfield. The value of the UL Rep subfield is the same in all User Info fields in the Trigger frame.

Note: for non-secure ranging, the UL Rep is set to a value no larger than the RSTA Assigned UL Rep (See 11.22.6.3 Fine Timing Measurement procedure negotiation). For secure ranging, the UL Rep is set to the RSTA Assigned UL Rep (See 11.22.6.3 Fine Timing Measurement procedure negotiation)

**9.4.2.279 Ranging Parameters**

*TGaz Editor: Update Figure 9-610b Ranging Parameters field format as shown below:*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Status Indication | Value | Secure LTF Required | Secure LTF Support | Max UL Rep | Max DL Rep  | Reserved | ISTA2RSTA LMR Required | Format and Bandwidth | Number of Antennas |
| Bits | 2 | 5 | 1 | 1 | 3 | 3 | 2 | 1 | 6 | 8 |

Figure 29-610b Ranging Parameters field format

*TGaz Editor: Insert descriptions of the new sub-fields as shown below:*

The Secure LTF Support field is set to 1 in the initial Fine Timing Measurement Request frame to indicate that an ISTA supports a secure LTF measurement exchange. Otherwise the Secure LTF Support field is set to 0. The Secure LTF Support field is reserved in the initial Fine Timing Measurement frame (see 11.22.6.3 (Fine timing measurement procedure negotiation)).

The Max UL Rep subfield indicates the maximum number of LTF repetitions that the FTM session uses in the preamble of UL NDP frames.

The Max UL Rep subfield indicates the maximum number of LTF repetitions that the FTM session uses in the preamble of DL NDP frames.

The values of 0 to 7 contained in the Max UL Rep and Max DL Rep subfield are mapped to 1 to 8 repetitions in the N\_REP parameter respectively (See 9.3.1.19 Ranging NDP Announcement frame format).

The ISTA2RSTA LMR Feedback subfield in the Ranging Parameters field is set to 1 in the Initial Fine Timing Measurement Request frame indicates that the ISTA is willing to report the estimated LMR to the RSTA; when included in the Initial Fine Timing Measurement frame indicates that the RSTA requires a LMR report from the ISTA at the end of each ranging exchange. Otherwise the ISTA2RSTA LMR Feedback subfield is set to 0. See 11.22.6.4.2.4 (TB Measurement Reporting Part) and 11.22.6.4.3.3 (Measurement Report)

**11.22.6.3.1 Range Measurement Negotiation**

*TGaz Editor: Insert after the last paragraph of Cl. 11.22.6.3.1:*

If a Ranging Parameters element is included in the initial Fine Timing Measurement Request frame, the initiating STA shall indicate the following parameters:

* maximum number of LTF repetitions it is capable of receiving in the preamble of the DL NDP frames, in the Max DL Rep subfield of the Ranging Parameters field.
* maximum number of LTF repetitions it is capable of transmitting in the preamble of the UL NDP frames in the Max UL Rep subfield of the Ranging Parameters field.

The ISTA shall set the Max DL Rep and Max UL Rep subfields to a value greater than 0 if the Secure LTF Required subfield of the Ranging Parameters field is equal to 1.

If the negotiation is successful and the selected range measurement mode is Tigger Based or non-Trigger Based, the corresponding initial Fine Timing Measurement frame from the responding STA shall include a Ranging Parameters element with the parameters that defines the negotiated range measurement session. The responding STA shall indicate the following parameters:

* maximum number of LTF repetitions allowed in the preamble of the DL NDP frames (referred to as *RSTA Assigned DL Rep*), which shall be no greater than the value in the corresponding IFTMR, in the Max DL Rep subfield of the Ranging Parameters field.
* maximum number of LTF repetitions allowed in the preamble of the UL NDP frames (referred to as *RSTA Assigned UL Rep*), which shall be no greater than the value in the corresponding IFTMR, in the Max UL Rep subfield of the Ranging Parameters field.

The RSTA shall set the Max DL Rep and Max UL Rep subfields to a value greater than 0 if the Secure LTF Required subfield of the Ranging Parameters field is equal to 1.

**11.22.6.4.3.3 TB Ranging Measurement Sounding Part**

*TGaz Editor: Insert after the following paragraph(s) in Cl. 11.22.6.4.3.3 as shown below:*

The RSTA shall select one bandwidth value for the measurement sounding part based on the Format and Bandwidth subfield of the Ranging Parameters field(s) (see 9.4.2.278) provided by each of the ISTAs during negotiation. This bandwidth can be different from the bandwidth used in the polling part but needs to adhere to the rules of multiple frame transmission in an EDCA TXOP (see 10.22.2.7).

* The RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH of the TF Ranging Sounding to that same bandwidth and use the same value for the BW subfield of the Common Info field of said TF.
* When transmitting the Ranging NDP-A and DL NDP frames, the RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH to that same bandwidth.
* Any ISTA that transmits an UL NDP as a response to the TF Location Sounding, shall set the TXVECTOR parameter CH\_BANDWIDTH to the value defined in the BW subfield of the Common Info field of the soliciting TF.

In the Sounding subvariant of the Ranging Trigger Frame, the RSTA shall set the UL Rep subfield of the User Info fields corresponding to each AID/RID of the ISTAs triggered by the Trigger frame to a value in the range 0 to *RSTA Assigned UL Rep*. Similarly, in the Ranging NDP Announcement frame, the RSTA shall set the DL Rep subfield of the STA Info fields corresponding to each AID/RID of the ISTAs addressed by that frame to a value in the range 0 to *RSTA Assigned DL Rep*.

**11.22.6.4.4.2 Non-TB Measurement Sounding Part**

*TGaz Editor: Insert afterthe following paragraph(s) in Cl. 11.22.6.4.4.2 as shown below:*

In the non-TB mesurement exchange sequence, the ISTA shall transmit the NDP-A frame with the same bandwidth as the UL NDP to reserve the medium; the RSTA shall transmit the DL NDP with the same bandwidth as the NDP-A and UL NDP, while the LMR can be transmitted at a different bandwidth, according to the rules of multiple frame transmission in an EDCA TXOP (see 10.22.2.7), i.e., not exceeding the bandwidth of the NDP-A, UL NPD and DL NDP. The allowed bandwidths for the NDP-A and UL/DL NDP frames are specified in the Format and Bandwidth subfield of the Ranging Parameters field (see 9.4.2.246).

Accordingly:

* An ISTA transmitting a Ranging NDP-A frame shall not use a bandwidth wider than that indicated by an RSTA in the Ranging Parameters element, in the initial Fine Timing Measurement frame. The TA field of the Ranging NDP Announcement frame is a bandwidth signalling TA when the Ranging NDP Announcement frame is sent in a non-HT duplicate PPDU (see 10.7.6.6)
* An ISTA transmitting an UL NDP shall set the TXVECTOR parameter CH\_BANDWIDTH to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging NDP-A frame.
* An RSTA transmitting a DL NDP shall set the TXVECTOR parameter CH\_BANDWIDTH to the bandwidth of the Ranging NDP-A frame and/or the UL NDP frame; which are obtained from the RXVECTOR parameter CH\_BANDWIDTH of the Ranging NDP-A frame or UL NDP frame respectively. For the NDP-A frame, when not received in an HE/VHT/HT PPDU: from the RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT when the Ranging NDP–A frame is received in a non-HT duplicate PPDU and is 20 MHz when the Ranging NDP-A frame is received in a non-HT PPDU.

In the Ranging NDP Announcement frame, the ISTA shall set the UL Rep subfield of the STA Info field to a value in the range 0 to *RSTA Assigned UL Rep;* the DL Rep subfield of the STA Info field to a value in the range 0 to *RSTA Assigned DL Rep*.