IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Max Number of LTF | | | | |
| Date: 2020-05-05 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Christian Berger | NXP | 350 Holger Way, San Jose, CA |  | [christian.berger@nxp.com](mailto:christian.berger@nxp.com) |
| Niranjan Grandhe | NXP | 350 Holger Way, San Jose, CA |  | [niranjan.grandhe@nxp.com](mailto:niranjan.grandhe@nxp.com) |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission:

* Proposes to add two subfields to the Ranging Parameters field to limit the maximum number of LTFs in a Ranging NDP
* Adds text in 11.22.6.3.3 to negotiate parameters for these new subfields and existing subfields controlling N\_STS in the Ranging NDPs
* Adds normative text in 11.22.6.4.3.3 and 11.22.6.4.4.2 on how to configure the NDPs

Revisions:

1. Small corrections.
2. Incorporate feedback
   1. Fixed typo
   2. Calrified that the I2R Rep has to be one value in TF Ranging Sounding.
3. Made changes more clear in tables

N\_STS

N\_REP

Max STS

Max Rep

Max LTF

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 TGax Draft. This introduction is not part of the adopted material.

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

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
|  |  |  |  |  |  |

**9.4.2.296 Ranging Parameters element**

TGaz Editor: Modify Figure 9-1006 of page 64 as follows: See underlined subfields and bit widths

The format of the Ranging Parameters field is shown in figure 9-1006 (Ranging Parameters field).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2-B6 | | | B7 | | | B8 | | | B9 | | B10 B11 | | | B12 | | B13 | | B14 | | B15 |
|  | Status Indi-cation | Value | | | ISTA-2-RSTA LMR Feedback | | | Secure LTF Req. | | | Secure LTF Support | | Ranging Priority | | | R2I ToA Type | | I2R ToA Type | | R2I AOA Req. | | I2R AOA Req. |
| Bits: | 2 | 5 | | | 1 | | | 1 | | | 1 | | 2 | | | 1 | | 1 | | 1 | | 1 |
|  | B16 B21 | | B22 | | | B23 | | | B24 B26 | | | B27 B29 | | | B30 | | B31 | | B32 B34 | | B35 B37 | |
|  | Format and Bandwidth | | Imme-diate R2I Feed-back | | | Imme- diate I2R Feed- back | | | Max I2R Rep | | | Max R2I Rep | | | Device Class | | Full Bandwidth UL MU-MIMO | | Max R2I STS  80 MHz | | Max R2I STS >  80 MHz | |
| Bits: | 6 | | 1 | | | 1 | | | 3 | | | 3 | | | 1 | | 1 | | 3 | | 3 | |
|  | B38 B39 | | | B40 B41 | | | B43 B45 | | | B45 B47 | | | |  | |
|  | Max R2I LTF Total | | | Max I2R LTF Total | | | Max I2R STS 80 MHz | | | Max I2R STS >  80 MHz | | | |  | |
| Bits: | 2 | | | 2 | | | 3 | | | 3 | | | |  | |

|  |
| --- |
| **Figure 9-1006 - Ranging Parameters field format** |

The Status Indication field indicates the responding STA’s response to the Fine Timing Request. The encoding of the Status Indication field is shown in Table 9-281 (Status Indication field 9 values).

TGaz Editor: Modify Figure 9-1006b of page 65 as follows: This should be a table

TGaz Editor: Add the following paragraphs on page 67 (line 7):

The Max R2I LTF Total and Max I2R LTF Total subfields indicate the maximum number of LTFs used in the R2I and I2R NDP respectively, the encoding is given in Table 9-1001b Max R2I/I2R LTF Total subfields. The maximum number of LTFs limits the allowed combinations of number of space-time streams and LTF repetitions, if a value is specified.

TGaz Editor: Add Table 9-1001b on page 65

Table 9-1001b – Max R2I/I2R LTF Total subfields

|  |  |
| --- | --- |
| Field value | Number of LTFs |
| 0 | 4 |
| 1 | 8 |
| 2 | 16 |
| 3 | No max specified |

**11.22.6.3.3 Negotiation for TB and non-TB ranging measurement exchange**

TGaz Editor: Change the following paragraph on page 112 (line 42) and add bullet points as follows

If a Ranging Parameters element is included in the IFTMR frame, the initiating STA shall indicate the following parameters in the Ranging Parameters field:

* maximum number of LTF repetitions it is capable of receiving in the preamble of the R2I NDP, in the Max R2I Rep subfield .
* maximum number of LTF repetitions it is capable of transmitting in the preamble of the I2R NDP, in the Max I2R Rep subfield.
* Maximum number of space-time streams it is capable of receiving in the R2I NDP for bandwidths less than or equal to 80 MHz, in the Max R2I STS ≤ 80 MHz subfield.
* Maximum number of space-time streams it is capable of receiving in the R2I NDP for bandwidths greater than 80 MHz, in the Max R2I STS > 80 MHz subfield.
* Maximum number of space-time streams it is capable of transmitting in the I2R NDP for bandwidths less than or equal to 80 MHz, in the Max I2R STS ≤ 80 MHz subfield.
* Maximum number of space-time streams it is capable of transmitting in the I2R NDP for bandwidths greater than 80 MHz, in the Max I2R STS > 80 MHz subfield.
* Maximum number of LTFs in total it is capable of receiving, including all repetitions, in the R2I NDP, in the Max R2I LTF Total subfield.
* Maximum number of LTFs in total it is capable of transmitting, including all repetitions, in the I2R NDP, in the Max I2R LTF Total subfield.

TGaz Editor: Change the following paragraph on page 114 (line 6) and add bullet points as follows

If the negotiation is successful and the selected range measurement mode is TB or non-TB, 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 in the Ranging Parameters field:

* maximum number of LTF repetitions it is capable of transmitting in the preamble of the R2I NDP, (referred to as *RSTA Assigned R2I Rep*), which shall be no greater than the value in the corresponding IFTMR, in the Max R2I Rep subfield.
* maximum number of LTF repetitions it is capable of receiving in the preamble of the I2R NDP (referred to as *RSTA Assigned I2R Rep*), which shall be no greater than the value in the corresponding IFTMR, in the Max I2R Rep subfield.
* Maximum number of space-time streams it is capable of transmitting in the R2I NDP for bandwidths less than or equal to 80 MHz (referred to as *RSTA Assigned R2I STS ≤ 80 MHz*), which shall be no greater than the value in the corresponding IFTMR, in the Max R2I STS ≤ 80 MHz subfield.
* Maximum number of space-time streams it is capable of transmitting in the R2I NDP for bandwidths greater than 80 MHz (referred to as *RSTA Assigned R2I STS > 80 MHz*), which shall be no greater than the value in the corresponding IFTMR, in the Max R2I STS > 80 MHz subfield.
* Maximum number of space-time streams it is capable of receiving in the I2R NDP for bandwidths less than or equal to 80 MHz (referred to as *RSTA Assigned I2R STS ≤ 80 MHz*), which shall be no greater than the value in the corresponding IFTMR, in the Max I2R STS ≤ 80 MHz subfield.
* Maximum number of space-time streams it is capable of receiving in the I2R NDP for bandwidths greater than 80 MHz (referred to as *RSTA Assigned I2R STS > 80 MHz*), which shall be no greater than the value in the corresponding IFTMR, in the Max I2R STS > 80 MHz subfield.
* Maximum number of LTFs in total it is capable of transmitting, including all repetitions, in the R2I NDP (referred to as *RSTA Assigned R2I LTF Total*), which shall be no greater than the value in the corresponding IFTMR, in the Max R2I LTF Total subfield.
* Maximum number of LTFs in total it is capable of receiving, including all repetitions, in the I2R NDP (referred to as *RSTA Assigned I2R LTF Total*), which shall be no greater than the value in the corresponding IFTMR, in the Max I2R LTF Total subfield.

**11.22.6.4.3.3 Measurement Sounding Phase of TB Ranging**

TGaz Editor: Change the following paragraphs on page 130 (line 24) and add bullet points as follows

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 UL BW subfield of the Common Info field of said Trigger frame. When transmitting the Ranging NDP Announcement frame and R2I NDP, the RSTA shall set the TXVECTOR parameter CH\_BANDWIDTH to that same bandwidth.

In the TF Ranging Sounding, the RSTA shall set the SS Allocation subfield and the I2R Rep subfield of the User Info fields corresponding to each of the ISTAs triggered by the Trigger frame in the following way:

* The Number of Spatial Streams in each SS Allocation subfield shall not exceed the *RSTA Assigned I2R STS ≤ 80 MHz* for the corresponding ISTA, if the UL BW subfield in the Common Info field indicated a bandwidth less than or equal to 80 MHz, and not exceed the *RSTA Assigned I2R STS > 80 MHz* for the corresponding ISTA otherwise
* All the I2R Rep subfields in the User Info fields of the TF Ranging Sounding shall be set to the same value. This value indicates the number of LTF repetitions in the I2R NDP preamble and shall not exceed any of the *RSTA Assigned I2R Rep* corresponding to the ISTA triggered by this Trigger frame. (#3699)
* The product of the number of LTF repetitions, indicated in each of the I2R Rep subfields of the User Info fields, and the number of HE-LTF symbols, indicated in the Number Of HE-LTF Symbols And Midamble Periodicity subfield in the Common Info field, shall not exceed the *RSTA Assigned I2R LTF Total* for any of the ISTA triggered by this Trigger frame.

Similarly, in the Ranging NDP Announcement frame, the RSTA shall set the R2I N\_STS subfield and R2I Rep subfield of the STA Info fields corresponding to each of the ISTAs, addressed by that frame in the following way

* The R2I N\_STS subfield value shall not exceed the *RSTA assigned R2I* *STS ≤ 80 MHz* for the corresponding ISTA, if the TXVECTOR parameter CH\_BANDWIDTH for this Ranging NDP Announcement frame is less than or equal to 80 MH, and not exceed *RSTA assigned R2I STS > 80 MHz* for the corresponding ISTA otherwise.
* The number of LTF repetitions in the R2I Rep subfield shall be set to a value not to exceed the *RSTA Assigned R2I Rep*, for the corresponding ISTA. (#3699)
* The combination of the values of the R2I N\_STS and the R2I Rep shall not lead to a total number of LTF that exceeds the *RSTA Assigned R2I LTF Total* for each corresponding ISTA.

11.22.6.4.4.2 Measurement Sounding phase of Non-TB Ranging

TGaz Editor: Change the following paragraphs starting on page 137 (line 21)

In the non-TB Ranging measurement exchange sequence, the ISTA shall transmit the Ranging NDP Announcement frame with the same bandwidth as the I2R NDP to reserve the medium (#1829); the RSTA shall transmit the R2I NDP with the same bandwidth as the Ranging NDP Announcement, 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 Ranging NDP Announcement, I2R NDP and R2I NDP. The allowed bandwidths for the Ranging NDP Announcement I2R NDP and R2I NDP are specified in the Format and Bandwidth subfield of the Ranging Parameters field (see 9.4.2.296). (#1895).

Accordingly:

* An ISTA transmitting a Ranging NDP Announcement 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 signaling TA when the Ranging NDP Announcement frame is sent in a non-HT duplicate PPDU (see 10.7.6.6)
* An ISTA transmitting an I2R NDP shall set the TXVECTOR parameter CH\_BANDWIDTH to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging NDP Announcement frame.
* An RSTA transmitting a R2I NDP shall set the TXVECTOR parameter CH\_BANDWIDTH to the bandwidth of the Ranging NDP Announcement frame and/or the I2R NDP; which are obtained from the RXVECTOR parameter CH\_BANDWIDTH of the Ranging NDP Announcement frame or I2R NDP respectively. For the Ranging NDP Announcement frame, when not received in an HE/VHT/HT PPDU: from the RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT when the Ranging NDP Announcement frame is received in a non-HT duplicate PPDU and is 20 MHz when the Ranging NDP Announcement frame is received in a non-HT PPDU.

If the bandwidth is less than or equal to 80 MHz, the ISTA shall set the I2R N\_STS subfield and the R2I N\_STS subfield in the STA Info field of the Ranging NDP Announcement frame each to a value not to exceed the *RSTA assigned I2R* *STS ≤ 80 MHz* and *RSTA assigned R2I* *STS ≤ 80 MHz* respectively. If the bandwidth is greater than 80 MHz, the ISTA shall set these same subfields to values not to exceed the *RSTA assigned I2R* *STS > 80 MHz* and *RSTA assigned R2I* *STS > 80 MHz* respectively.

The ISTA shall set the I2R Rep subfield and R2I Rep subfield in the STA Info field of the Ranging NDP Announcement frame each to a value not to exceed the *RSTA assigned I2R rep* and *RSTA assigned R2I rep* respectively. Furthermore, the total number of LTF in the I2R NDP and R2I NDP, based on the number of spatial streams and repetitions, shall not exceed the *RSTA assigned I2R LTF Total* and *RSTA assigned R2I LTF Total* respectively.