IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment Resolution LB253 Parameters – part 2 | | | | |
| Date: 2021-01-08 | | | | |
| 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) |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes the comment resolution of CIDs 5204, 5072, 5205, 5207, 5405, 5405, 5214, 5215, 5216, 5151 in LB253, changes are relative to Draft 3.0.

Revisions:

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** |
| **5204** | 173.18 | 11.21.6.4.6 | There needs to be text to set the tx window used in secure LTF | Add text that states that if tx window was negotiated, and this is a secure LTF, then indicate as much to the PHY | **Revised**  Agree in principle.  https://mentor.ieee.org/802.11/dcn/21/11-21-0053-01-00az-comment-resolution-lb249-cid-3260.docx |
| **5072** | 175.09 | 11.21.6.4.6 | Modify the text 'The GI\_TYPE parameter is set to either 0u8s\_GI or 1u6s\_GI' to | The GI\_TYPE parameter is set to 1u6s\_GI |  |
| **5205** | 175.09 | 11.21.6.4.6 | "The GI\_TYPE parameter is set to either 0u8s\_GI or 1u6s\_GI" - 0.8 is no longer supported | Change to "The GI\_TYPE parameter is set to 1u6s\_GI" |  |
| **5207** | 176.01 | 11.21.6.4.6 | "The GI\_TYPE parameter is set to either 0u8s\_GI or 1u6s\_GI" - 0.8 is no longer supported | Change to "The GI\_TYPE parameter is set to 1u6s\_GI" |  |
| **5405** | 175.09 | 11.21.6.4.6 | Need to remove option of 0u8s\_GI from GI\_TYPE parameter, since 11az PHY only supports 1.6us GI | Change sentence to "The GI\_TYPE parameter is set to 1u6s\_GI" |  |
| **5405** | 176.01 | 11.21.6.4.6 | Need to remove option of 0u8s\_GI from GI\_TYPE parameter, since 11az PHY only supports 1.6us GI | Change sentence to "The GI\_TYPE parameter is set to 1u6s\_GI" |  |
|  |  |  |  |  |  |
| **5214** | 222.01 | 27.2.2 | Add a flag for use tx window for secure LTF to TXVECTOR and RXVECTOR parameters | Add an entry "SECURE\_LTF\_TX\_WINDOW" applies for same frame types as RANGING\_FLAG; Set to 1 when secure HE-LTF should use tx window; 0 otherwise |  |
| **5215** | 223.08 | 27.2.3a | Add a flag for use tx window for secure LTF to LTFVECTOR parameters | Add an entry "SECURE\_LTF\_TX\_WINDOW": Indicates if secure HE-LTF should use tx window |  |
| **5216** | 224.21 | 27.3.18a | Clarify when optional Tx window is used. | Refer to new TXVECTOR variable SECURE\_LTF\_TX\_WINDOW |  |
| **5151** | 234.34 | 27.3.18d | flat top window usage is optional so need to add capability negotiation on its usage | as in the comment |  |
|  |  |  |  |  |  |

11.21.6.4.6 Transmission of a ranging NDP

TGaz Editor: Modify the following paragraphs starting on page 173 (line 18) as follows

An RSTA transmitting an HE Ranging NDP to one or more peer ISTAs shall set the TXVECTOR parameter as follows:

* The FORMAT parameter is set to HE\_SU
* The RANGING\_FLAG is set to 1
* The UPLINK\_FLAG parameter is set to 0
* The APEP\_LENGTH parameter is set to 0
* The SECURE\_LTF\_FLAG is set as follows:
  + Is set to 0 in the TB Ranging measurement exchange ([11.21.6.4.3](#H11o21o6o4o3)) and Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)).
  + Is set to 1 in the TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)) and the Non-TB Ranging measurement exchange with secure LTF ([11.21.6.4.5.3](#H11o21o6o4o5o3)).
* The TX\_WINDOW\_FLAG is set to 1 if the SECURE\_LTF\_FLAG is set to 1 and the RSTA and ISTA have negotiated to include the frequency domain Tx Window for R2I NPDs; it is set to 0 otherwise.
* In the TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)), the NUM\_USER parameter is set to the number of ISTAs that the HE Ranging NDP is transmitted to. (#**3264**)
* In the Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)), the TXPWR\_LEVEL\_INDEX parameter is set to a value that matches the Tx Power value indicated in the R2I NDP Tx Power field in the following LMR frame, except if the value in the R2I NDP Tx Power field was set to a reserved value. (#**3883**)
* The NUM\_STS parameter is set as follows:
  + In the TB Ranging measurement exchange ([11.21.6.4.3](#H11o21o6o4o3)), set to the same value as the R2I N\_STS field in the STA Info field in the preceding Ranging NDP Announcement frame.
  + In the TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)). (#**3895**)
    - The NUM\_STS[*p*] is set to the same value as the R2I N\_STS field in the STA Info field addressed to the corresponding STA *p* in the preceding Ranging NDP Announcement frame plus 1 when the HE Ranging NDP is transmitted to more than one ISTA.
    - The NUM\_STS is set to the same value as the R2I N\_STS field in the first STA Info field in the preceding Ranging NDP Announcement frame lus 1 when the HE Ranging NDP is transmitted to one ISTA.
  + In the Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)) and the Non-TB Ranging measurement exchange with secure LTF ([11.21.6.4.5.3](#H11o21o6o4o5o3)), set to the same value as the R2I N\_STS field in the STA Info field in the preceding Ranging NDP Announcement frame plus 1.
* The LTF\_REP parameter is set as follows:
  + In the TB Ranging measurement exchange ([11.21.6.4.3](#H11o21o6o4o3)), set to the same value as the R2I Rep field in the STA Info field in the preceding Ranging NDP Announcement frame.
  + In the TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)): (#**3895**)
    - The LTF\_REP[*p*] is set to the same value as the R2I Rep field in the STA Info field addressed to the corresponding STA *p* in the preceding Ranging NDP Announcement frame when the HE Ranging NDP is transmitted to more than one ISTA.
    - The LTF\_REP is set to the same value as the R2I Rep field in the first STA Info field in the preceding Ranging NDP Announcement frame when the HE Ranging NDP is transmitted to one ISTA.
  + In the Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)) and the Non-TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.3](#H11o21o6o4o5o3)), set to the same value as the R2I Rep subfield in the STA Info field in preceding Ranging NDP Announcement frame.
* The CH\_BANDWIDTH parameter is set as follows:
  + In the TB Ranging measurement exchange ([11.21.6.4.3](#H11o21o6o4o3)), and TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)), set to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging Sounding Trigger frame
  + In the Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)) and Non-TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.3](#H11o21o6o4o5o3)), set to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging NDP Announcement frame
* In the TB and Non-TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5](#H11o21o6o4o5)), the LTF\_KEY parameter is set as defined in [11.21.6.4.5.2](#H11o21o6o4o5o2) (TB Ranging measurement exchange with Secure LTF) and [11.21.6.4.5.3](#H11o21o6o4o5o3) (Non-TB Ranging measurement exchange with Secure LTF). Otherwise, the LTF\_KEY parameter is not present.
* In the TB Ranging measurement exchange with Secure LTF, the LTF\_OFFSET parameter is set as defined in [11.21.6.4.5.2](#H11o21o6o4o5o2) (TB Ranging measurement exchange with Secure LTF). Otherwise, the LTF\_OFFSET parameter is not present.
* The HE\_LTF\_TYPE parameter is set to 2xHE-LTF
* The GI\_TYPE parameter is set to either 1u6s\_GI
* The SPATIAL\_REUSE parameter is set to SRP\_AND\_NON-SRG\_OBSS-PD\_PROHIBITED
* The BSS\_COLOR parameter is set to the value indicated in the BSS Color subfield of the HE Operation element transmitted by the RSTA
* The TXOP\_DURATION parameter is set to either 127 or a value defined in Equation (27-2), replacing *D*HE\_Ranging NDP Announcement by *D*Ranging\_NDP\_nnouncement which is the value of the Duration/ID field in the MAC header of the preceding Ranging NDP Announcementframe

An ISTA transmitting an HE Ranging NDP shall set the TXVECTOR parameter as follows:

* The FORMAT parameter is set to HE\_SU
* The RANGING\_FLAG is set to 1
* The UPLINK\_FLAG parameter is set to 1
* The APEP\_LENGTH parameter is set to 0
* The SECURE\_LTF\_FLAG is set as follows:
  + Is set to 0 in the Non-TB Ranging measurement exchange ([11.21.6.4.4](#H11o21o6o4o4)).
  + Is set to 1 in the Non-TB Ranging measurement exchange with secure LTF ([11.21.6.4.5.3](#H11o21o6o4o5o3)),
* The TX\_WINDOW\_FLAG is set to 1 if the SECURE\_LTF\_FLAG is set to 1 and the RSTA and ISTA have negotiated to include the frequency domain Tx Window for I2R NPDs; it is set to 0 otherwise.
* The NUM\_STS parameter is set to the same value as the I2R N\_STS subfield in the STA Info field in the preceding Ranging NDP Announcement frame plus 1.
* The LTF\_REP parameter is set to the same value as the I2R Rep subfield in the STA Info field in the preceding Ranging NDP Announcement frame
* The TXPWR\_LEVEL\_INDEX parameter is set to a value that matches the Tx Power value indicated in the I2R NDP Tx Power subfield in the STA Info field with the AID11 subfield set to 2045 in the preceeding Ranging NPD Announcement frame, except if the value in the I2R NDP Tx Power subfield was set to a reserved value. (#**3883**)
* The CH\_BANDWIDTH set to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging NDP Announcement frame
* In the Non-TB Ranging measurement exchange with Secure LTF, the LTF\_KEY parameter is set as defined in [11.21.6.4.5.2](#H11o21o6o4o5o2) (Non-TB Ranging measurement exchange with Secure LTF). Otherwise, the LTF\_KEY parameter is not present
* The HE\_LTF\_TYPE parameter is set to 2xHE-LTF
* The GI\_TYPE parameter is set to either 1u6s\_GI
* The SPATIAL\_REUSE parameter is set to SRP\_AND\_NON-SRG\_OBSS-PD\_PROHIBITED
* The BSS\_COLOR parameter is set to the value indicated in the BSS Color subfield of the HE Operation element received from the RSTA
* The TXOP\_DURATION parameter is set to either 127 or a value defined in Equation (27-2), replacing *D*HE\_Ranging NDP Announcement by *D*Ranging NDP Announcement which is the value of the Duration/ID field in the MAC header of the preceding Ranging NDP Announcementframe,

An ISTA transmitting an HE TB Ranging NDP to an RSTA shall set the TXVECTOR parameter as follows:

* The FORMAT parameter is set to HE\_TB
* The RANGING\_FLAG is set to 1
* The APEP\_LENGTH parameter is set to 0
* The SECURE\_LTF\_FLAG is set as follows:
  + Is set to 0 in the TB Ranging measurement exchange ([11.21.6.4.3](#H11o21o6o4o3)).
  + Is set to 1 in the TB Ranging measurement exchange with Secure LTF ([11.21.6.4.5.2](#H11o21o6o4o5o2)).
* The TX\_WINDOW\_FLAG is set to 1 if the SECURE\_LTF\_FLAG is set to 1 and the RSTA and ISTA have negotiated to include the frequency domain Tx Window for I2R NPDs; it is set to 0 otherwise.
* The NUM\_STS parameter is set to the same value as the Number Of Spatial Streams subfield in the SS Allocation field in the User Info field in the preceding Ranging Sounding Trigger frame
* The LTF\_REP parameter is set to the same value as the I2R Rep subfield in the User Info field in the preceding Ranging Sounding Trigger frame plus 1. (#**3868**)
* The CH\_BANDWIDTH parameter is set to the same value as the TXVECTOR parameter CH\_BANDWIDTH in the preceding Ranging Sounding Trigger frame
* In the TB Ranging measurement exchange with Secure LTF, the LTF\_KEY parameter is set as defined in [11.21.6.4.5.2](#H11o21o6o4o5o2) (TB Ranging measurement exchange with Secure LTF). Otherwise, the LTF\_KEY parameter is not present
* The HE\_LTF\_TYPE parameter is set to 2xHE-LTF
* The GI\_TYPE parameter is set to 1u6s\_GI
* The SPATIAL\_REUSE parameter is set to SRP\_AND\_NON-SRG\_OBSS\_PD\_PROHIBITED
* The BSS\_COLOR parameter is set to the value indicated in the BSS Color subfield of the HE Operation element received from the RSTA

The TXOP\_DURATION parameter is set as defined in 26.11.5 (TXOP\_DURATION)

27.2.2 TXVECTOR and RXVECTOR parameters

TGaz Editor: Modify Table 27-1—TXVECTOR and RXVECTOR parameters as follows

1. Table 27-1—TXVECTOR and RXVECTOR parameters (#3629)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Condition | Value | | TXVECTOR | | | RXVECTOR |
|  | | (…existing fields…) | | | | | | |
| TIME\_OF\_DEPARTURE\_REQUESTED | | Format is HE\_SU | Enumerated type:  True indicates that the MAC entity requests that the PHY entity measures and reports time of departure parameters corresponding to the time when the first frame energy is sent by the transmitting port.  False indicates that the MAC entity requests that the PHY entity neither measures nor reports time of departure parameters. | | O | | | N |
|  | | Format is HE\_ER\_SU, HE\_MU or HE\_TB | Not present | | N | | | N |
| Otherwise | See corresponding entry in Table 21-1(TXVECTOR and RXVECTOR parameters). | |  | | |  |
| RX\_START\_OF\_ FRAME\_OFFSET | | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). | | | | | | |
| LTF\_KEY | | FORMAT is either HE\_SU or HE\_TB and RANGING\_FLAG is 1 and SECURE\_LTF\_FLAG is 1 | Contains the *rsta-ltf-key* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) when the secure HE-LTFs are used and the UPLINK\_FLAG parameter is set to 0 (see [11.21.6.4.6](#H11o21o6o4o6) (Secure Non-TB and -TB Ranging Measurement Exchange Protocol)).  Contains the *ista-ltf-key* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) when the secure HE-LTFs are used and the UPLINK\_FLAG parameter is set to 1 (see [11.21.6.4.6](#H11o21o6o4o6) (Secure Non-TB and -TB Ranging Measurement Exchange Protocol)).  (#**2289**, #**1828**, #**1831**) | | O | | | N |
| Otherwise | Not present (#**2356**, #**2357**, #**2359**) | | | | | |
| LTF\_IV | | FORMAT is either HE\_SU or HE\_TB and RANGING\_FLAG is 1 and SECURE\_LTF\_FLAG is 1 | Contains the *ltf-iv* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) used to generate the secure HE-LTFs or null otherwise. Must be non-null if LTF\_KEY is not null. | | O | | | N |
| Otherwise | Not present (#**2356**, #**2357**, #**2359**) | | | | | |
| LTF\_REP | | FORMAT is either HE\_SU or HE\_TB and RANGING\_FLAG is 1 (#**1298**) | Indicate the number of repetitions of the HE-LTF symbols.  Set to the number of repetitions minus 1. | | O | | | N |
| Otherwise | Not present (#**2356**, #**2357**, #**2359**) | | | | | |
| RANGING\_FLAG (#2502) | | FORMAT is HE\_SU or HE\_ER\_SU | | | Indicate whether the PPDU is a HE Ranging NDP or HE TB Ranging NDP.  Set to 1 when the PPDU is HE Ranging NDP or HE TB Ranging NDP.  Set to 0 otherwise. | | Y | N | | |
| MU |
| FORMAT is HE\_MU or HE\_TB | | |
| Otherwise | | | See corresponding entry in Table 19-1 (RXVECTOR and RXVECTOR parameters) and Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| PSDU\_LENGTH | | FORMAT is HE\_SU, HE\_MU, HE\_ER, HE\_ER\_SU or HE\_TB | | | Indicates the number of octets in the PSDU in the range of 0 to a PDUMaxLength octets; see Table 27-53 (HE PHY characteristics). A value of 0 indicates and HE NDP, HE Ranging NDP or HE TB Ranging NDP. | | N | Y | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| NUM\_STS | | FORMAT is HE\_SU | | | Indicates the number of space-time streams.  Integer in the range 1-8. | | Y | Y | | |
| FORMAT is HE\_ER\_SU | | | Indicates the number of space-time streams.  Integer in the range 1-2. | |  |  | | |
| FORMAT is HE\_MU | | | Indicates the number of space-time streams. Integer in the range:  1-4 per user per MU-MIMO RU in the TXVECTOR  1-4 per MU-MIMO RU in the RXVECTOR  1-8 per RU assigned to no more than 1 user in the TXVECTOR and RXVECTOR  NUM\_STS summed over all users per RU is not greater than 8. | | MU | Y | | |
| FORMAT is HE\_TB | | | Indicates the number of space-time streams. Integer in the range:  1-4 for a MU-MIMO RU in the TXVECTOR  1-4 per user per MU-MIMO RU in the RXVECTOR  1-8 for an RU assigned to no more than 1 user in the TXVECTOR and RXVECTOR  NUM\_STS summed over all users per RU is not greater than 8 | | MU | MU | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| NUM\_USERS | | FORMAT is HE\_SU, RANGING\_FLAG is 1, and SECURE\_LTF\_FLAG is 1 | | | Indicating the number of users of an HE Ranging NDP with secure LTF (#**2359**)  If NUM\_USERS is larger than 1, NUM\_STS, LTF\_REP, and LTF\_KEY will be MU | | O | N | | |
| FORMAT is HE\_SU, HE\_MU, HE\_ER, HE\_ER\_SU or HE\_TB | | | Not present.  NOTE-number of users for an HE SU PPDU, HE ER SU PPDU or HE TB PPDU is otherwise 1. The number of users for an HE MU PPDU is determined by RU\_ALLOCATION. | | N | N | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| PSDU\_LENGTH | | FORMAT is HE\_SU, RANGING\_FLAG is 1, and SECURE\_LTF\_FLAG is 0. (#**3264**)  FORMAT is HE\_SU, HE\_MU, HE\_ER, HE\_ER\_SU or HE\_TB | | | Indicates the number of octets in the PSDU in the range of 0 to a PDUMaxLength octets (see Table 27-53 (HE PHY characteristics)). A value of 0 indicates and HE sounding NDP, HE Ranging NDP or HE TB Ranging NDP. | | N | Y | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| SECURE\_LTF\_FLAG | | FORMAT is either HE\_SU or HE\_TB and RANGING\_FLAG is 1 | | | Indicate whether the HE Ranging NDP or HE TB Ranging NDP will use Secure LTF.  Set to 1 when Secure LTF are used.  Set to 0 otherwise. | | Y | N | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |
| TX\_WINDOW\_FLAG | | FORMAT is either HE\_SU or HE\_TB and and RANGING\_FLAG is 1 SECURE\_LTF\_FLAG is 1 | | | Indicate whether the Secure LTF of an HE Ranging NDP or HE TB Ranging NDP will include a frequency domain Tx Window.  Set to 1 when TxWindow is used.  Set to 0 otherwise. | | Y | N | | |
| Otherwise | | | See corresponding entry in Table 21-1 (RXVECTOR and RXVECTOR parameters). | | | | | |

27.2.3a LTFVECTOR parameters

The LTFVECTOR is carried in a PHY-RXLTFSEQUENCE.request for the PHY of STA to receive an HE Ranging NDP or an HE TB Ranging NDP. The parameters in Table [27-2a](#T27o2a) (LTFVECTOR parameters) are defined as part of the LTFVECTOR parameter list in the PHY-RXLTFSEQUENCE.request primitive. (#3215, #3354, #3911, #3920, #4018)

TGaz Editor: Modify 27-2a—LTFVECTOR parameters as follows

|  |  |
| --- | --- |
| Table 27-2a—LTFVECTOR parameters | |
| Parameter | Value |
| LTF\_KEY | Contains the *rsta-ltf-key* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) when receiving the secure HE-LTFs sent by an RSTA; see [11.21.6.4.6](#H11o21o6o4o6) (Secure Non-TB and -TB Ranging Measurement Exchange Protocol).  Contains the *ista-ltf-key* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) when receiving the secure HE-LTFs sent by an ISTA; see [11.21.6.4.6](#H11o21o6o4o6) (Secure Non-TB and -TB Ranging Measurement Exchange Protocol).  . (#**2289**, #**1828**, #**1831**). |
| LTF\_IV | Contains the *ltf-iv* (See [11.21.6.4.5.4](#H11o21o6o4o5o4) (Secure LTF Octet Stream Generation)) for secure HE-LTFs or null otherwise. Must be non-null if LTF\_KEY is not null. |
| LTF\_OFFSET | Indicates the number of HE-LTF to skip to receive in the following HE Ranging NDP. |
| LTF\_N\_STS | Indicate the number of space-time streams to receive in the following HE Ranging NDP or the following HE TB Ranging NDP. |
| LTF\_REP | Indicate the number of repetitions of the HE-LTF symbols to receive in the following HE Ranging NDP or the following HE TB Ranging NDP. |
| SECURE\_LTF\_FLAG | Indicate whether the HE Ranging NDP or HE TB Ranging NDP will use Secure LTF. |
| TX\_WINDOW\_FLAG | Indicate whether the Secure LTF of an HE Ranging NDP or HE TB Ranging NDP will include a frequency domain Tx Window. |

27.3.18a HE Ranging NDP

TGaz Editor: Modify the following paragraphs starting on page 224 (line 11) as follows

The HE Ranging NDP has the following properties:

* Uses the HE SU PPDU format but without the Data field.
* No beamforming steering matrix is applied to the waveform, the Beamformed field in HE-SIG-A of an HE Ranging NDP is always set to 0. For transmission of HE-LTFs, if NSTS = NTx, the Q matrix shall be an Identity matrix, and if NSTS < NTx, the Q matrix shall be based on an antenna selection matrix with no antenna swapping. The Q matrix becomes an Identity matrix when all 0 rows are removed. (#**2302**, #**3270**)
* Uses HE-LTFs or Secure HE-LTFs when the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 0 or 1 respectively.
* Secure HE-LTFs use randomized LTF sequences, pseudo random and deterministic per stream phase rotation and when the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 1, a frequency domain flat top window instead of the frequency domain rectangular window, see [27.3.18d](#H27o3o18d) (Construction of Secure HE-LTF). (#**3215**, #**3354**, #**3911**, #**3920**, #**4018**)
* Has a Packet Extension (PE) field that is 4 µs in duration; when using Secure HE-LTFs, the PE will start with a zero-power GI.
* When the TXVECTOR parameter NUM\_USER is more than 1, the TXVECTOR parameter NUM\_STS[1] is used to encode the NSTS And Mid-amble Periodicity field of the HE-SIG-A1. Otherwise, the TXVECTOR parameter NUM\_STS is used to encode the NSTS And Mid-amble Periodicity field of the HE-SIG-A1.
* The TXVECTOR parameter LTF\_REP that indicates the number of repetitions of the HE-LTF symbols. For decoding the HE-LTF fields, a PHY-RXLTFSEQUENCE.request primitive issued from the MAC provides the LTF\_REP parameter and LTF\_OFFSET parameter, which are not encoded in the HE-SIG-A, but included in the preceding Ranging NDP Announcement frame. The LTF\_OFFSET parameter indicates the number of secure HE-LTF symbols to skip for receiving the corresponding user’s HE-LTF field, e.g., in Figure [27-46d](#F27o46d) the LTF\_OFFSET for the first and second user would be 0 and 4 respectively (#**3271**).

The only supported mode is 2x HE-LTF with 1.6 µs GI. The other combinations of HE-LTF modes and GI duration are disallowed. (#**4014**)

The number of HE-LTF symbols in an HE Ranging NDP depends on the number of space-time streams N\_STS, the number of LTF repetitions LTF\_REP, and, when Secure HE-LTFs are used, the number of users NUM\_USERS.

TGaz Editor: Modify the following paragraphs starting on page 225 (line 13) as follows

When the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 0, HE-LTFs as defined in Subclause 27.3.11.10 (HE-LTF) are used in the HE Ranging NDP. The number of HE-LTF symbols is the product of the number of LTF repetitions LTF\_REP and the conventional number of HE-LTF, N\_HE-LTF, based on the number of space-time streams N\_STS, as defined in Table 21-13 (Number of VHT-LTFs required for different numbers of space-time streams). The construction of the HE-LTFs in an HE Ranging NDP is done by repeating the steps in Subclause 27.3.6.9 (Construction of HE-LTF) LTF\_REP times. If the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 0, the TXVECTOR parameter NUM\_USERS is not present, which is then assumed to be 1.

When the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 1, Secure HE-LTFs as defined in [27.3.18d](#H27o3o18d) (Construction of Secure HE-LTF), are used and the Packet Extension field will be partially replaced by a zero power GI in its first 1.6 µs, see Figure [27-46c](#F27o46c) (HE Ranging NDP format with Secure HE-LTFs). For the secure HE-LTF symbol or packet extension field with zero-power GI, the time domain signal has zero power during the period of the GI. The total number of HE-LTF symbols is the product of the number of LTF repetitions LTF\_REP and *NHE-LTF*, the number of HE-LTF based on the number of space-time streams N\_STS, as defined in Table 21-13 (Number of VHT-LTFs required for different numbers of space-time streams). (#**2499**, #**4014**)

TGaz Editor: Modify the following paragraphs starting on page 226 (line 1) as follows

When the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 1 and the NUM\_USERS parameter is larger than 1, the TXVECTOR parameters LTF\_KEY, NUM\_STS and LTF\_REP will be in array form with NUM\_USERS entries. The number of Secure HE-LTF will depend on the sum of: N\_HE-LTF times LTF\_REP, across all users. In this case, the repetitions of the HE-LTF symbols are repetition of the structure for HE-LTF fields. The randomized HE-LTF sequences are different for HE-LTF repetitions. (#**2357**)

The Secure HE-LTF for each user are concatenated one after another to a maximum of 64 Secure HE-LTF. The sum Tx power across all the Nsts in each user’s secure HE-LTF field shall stay the same. (#**3129**)

27.3.18b HE TB Ranging NDP

TGaz Editor: Modify the following paragraphs starting on page 226 (line 17) as follows

The HE TB Ranging NDP has the following properties:

* Uses the HE TB PPDU format but without the Data field.
* No beamforming steering matrix is applied to the waveform.
* Uses HE-LTFs or Secure HE-LTFs when the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 0 or 1 respectively.
* Secure HE-LTFs use randomized LTF sequences, pseudo random and deterministic per stream phase rotation and when the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 1, a frequency domain flat top window instead of the frequency domain rectangular window see [27.3.18d](#H27o3o18d) (Construction of Secure HE-LTF). (#3215, #3354, #3911, #3920, #4018)
* Has a Packet Extension (PE) field that is 4 µs in duration; when using Secure HE-LTFs, the PE will start with a zero-power GI.
* For transmission of HE-LTFs, if NSTS = NTx, the Q matrix shall be an Identity matrix, and if NSTS < NTx, the Q matrix shall be an antenna selection matrix with no antenna swapping. The Q matrix becomes an Identity matrix when all 0 rows are removed. (#**3128**)

The only supported mode is the 2x HE-LTF with 1.6 µs GI. The other combinations of HE-LTF modes and GI duration are disallowed.

The number of HE-LTF symbols in an HE TB Ranging NDP is the product of the usual number of HE-LTF symbols N\_HE\_LTF and the number of LTF repetitions LTF\_REP.

When the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 0, HE-LTFs as defined in Subclause 27.3.11.10 (HE-LTF) are used.

When the TXVECTOR parameter SECURE\_LTF\_FLAG is set to 1, Secure HE-LTFs as defined in [27.3.18d](#H27o3o18d) (Construction of Secure HE-LTF) are used and the Packet Extension field will be partially replaced by a zero power GI in its first 1.6 µs; see Figure [27-46f](#F27o46f) (HE TB Ranging NDP format with Secure HE LTFs). The repetitions of the HE-LTF symbols are repetition of the structure for HE-LTF fields. The randomized HE-LTF sequences are different for HE-LTF repetitions. (#**2357**)

27.3.18d Construction of Secure HE-LTF

TGaz Editor: Modify the following paragraphs starting on page 232 (line 18) as follows

The Secure HE-LTF field is largely like the HE-LTF field defined in 27.3.11.10 (HE-LTF), the main differences are as follows: (#3215, #3354, #3911, #3920, #4018)

* The HE-LTF sequence is replaced by the randomized LTF sequence described in [27.3.18c](#H27o3o18c) (Generation of Randomized LTF Sequence)
* The conventional GI is replaced by a zero-power GI.
* There are no single stream pilot subcarriers in the secure HE-LTFs, all subcarriers are mapped using the matrix (#**1342**)
* No CSD is applied to the space-time streams.
* Each spatial stream has a per stream pseudo random and deterministic phase rotation applied to all the subcarriers.
* A frequency domain flat top window is applied to the secure HE-LTF when configured.

The construction of the Secure HE-LTF field is as follows:

1. Sequence generation: Generate the randomized LTF sequence in frequency domain over the bandwidth indicated by CH\_BANDWIDTH as described in Subclause [27.3.18c](#H27o3o18c) (Generation of Randomized LTF Sequence).
2. Apply per spatial stream phase rotation: Generate the pseudo random phase rotation for each spatial stream. Apply the pseudo random phase rotation along with the deterministic phase rotation to the spatial streams as described in Subclause 23.3.18e (Pseudo Random and Deterministic Per Spatial Stream Phase Rotations).
3. matrix mapping: Apply the matrix to all tones of the secure HE-LTF sequence. (#**1342**)
4. A frequency domain window function is applied to all the tones of the secure HE-LTF sequence. When the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 0, the Rectangular window is used, where for all the tones in all channel bandwidths. When the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 1, the flat top window is used; it is defined as:   
    (27-126d)

where   
and the impulse response p(n) is given by:  
  
  
 (27-126e)  
where  
  
a0 = 0.21557895,   
a1 = -0.41663158,   
a2 = 0.277263158,  
a3 = -0.083578947,  
a4 = 0.006947368 and  
NWinFT = 20.  
  
Note that the shall be normalized to have unit RMS power.  
In Equations ([27-126d](#E27o126d)) and ([27-126e](#E27o126e)), the LTF subcarrier values , where is 11az secure LTF sequence constructed after step c).

1. There is no CSD per space-time stream.
2. There is no spatial mapping, the Q matrix is a block identity matrix.
3. IDFT: Compute the inverse discrete Fourier transform.
4. Insert zero-power GI and apply windowing: Prepend values of zero of length indicated by the TXVECTOR parameter GI\_TYPE and apply windowing as described in 27.3.10 (Mathematical description of signals).
5. Analog and RF: Upconvert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit. Refer to 27.3.9 (Mathematical description of signals) and 27.3.11 (HE preamble) for details.