IEEE P802.11  
Wireless LANs

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| CC28 CR of Secure TB Ranging Measurement Exchange Protocol | | | | |
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**Abstract**

This submission proposes resolutions of comments received from TGaz CC28.

(The proposed change is based on TGaz Draft 0.5.)

* CIDs: 542, 54, 55, 105, 106 (5 CIDs)

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 TGaz 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.***

| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- |
| 542 | 65.00 | 11.22.6.4.6.2 | The HEz secure LTF measurement exchange protocol supports one or more STAs. But, current HEz mode description is written for only single STA. | As in comment. | Revised-  Agree in principle.  Since the secure TB ranging mode supports the multiple STAs in a single sounding sequence, additional normative text for the Offset, DL N\_STS, DL Rep subfields setting in the Ranging NDP Announcement frame is needed.  TGaz editor makes changes as shown in the as specified in 11-18/1782r2. |
| 54 | 66.00 | 11.22.6.4.6.2 | Paragraph between line 28-35 is somewhat confusing. Perhaps we can modify the phrase on line 34-35 to read "....that solicits the UL NDP and the corresponding DL NDP after NDP Announcement" | As per comment | Revised-  Agree in principle.  The proposed changes resolve some ambiguity.  TGaz editor makes changes as shown in the as specified in 11-18/1782r2. |
| 55 | 70.00 | 11.22.6.4.6.2 | Replace "TB" with "SU"? | As per comment | Revised-  Agree in principle.  The proposed changes fix the wrong PPDU name.  TGaz editor makes changes as shown in the as specified in 11-18/1782r2. |
| 105 | 74.00 | 11.22.6.4.6.2 | In HEz ranging the RSTA may send multiple Trigger frames of Type Location and Subtype Sounding. It is not clear what does the RSTA do if it does not receive NDP from an ISTA after sending one such Trigger frame. | Specify the behavior when RSTA receives the correct NDP response frames following some Trigger frame of SubType Sounding and not from at least one inside the same HEz ranging sequence. | Revised-  Agree in principle.  The proposed changes resolve some ambiguity about the RSTA’s behavior.  TGaz editor makes changes as shown in the as specified in 11-18/1782r21782r2. |
| 106 | 74.00 | 11.22.6.4.6.2 | "The RSTA determines the LTF sequence of the UL NDP and the LTF sequence of the DL NDP with the LTF Sequence Generation Information in the Secure LTF Parameters field in the most recently transmitted an initial Fine Timing Measurement frame or a Location Measurement 44 Report frame ..." Is it the most recent IFTMR frame to that particular ISTA in question or to any ISTA ? | Clarify whether IFTMR in question is to that particular ISTA who is the sender of the UL NDP or any IFTMR frame. | Revised-  Agree in principle.  The answer of the question from the commenter is the sender of the UL NDP.  The proposed changes resolve some ambiguity about the RSTA’s behavior.  TGaz editor makes changes as shown in the as specified in 11-18/1782r21782r2. |

***TGaz Editor: Change the title of 11.22.6.4.6.2 as follows:***

11.22.6.4.6.2 Secure TB ranging mode

***TGaz Editor: Change the subclause 11.22.6.4.6.2 as follows:***

~~An RSTA sends a Location variant HEz Uplink Sounding Trigger frame where the LTF Generation SAC subfield in the Trigger Dependent User Info field in the Location variant HEz Uplink Sounding Trigger frame is set to the same value as in the LTF Generation SAC field in the Secure LTF Parameters field in the most recently transmitted an initial Fine Timing Measurement frame or a Location Measurement Report frame, except when a current LTF Generation SAC and its associated LTF Sequence Generation Information stored as the RSTA have been discarded. In which case, an RSTA that sends a Location variant HEz Uplink Sounding Trigger frame shall set the LTF Generation SAC subfield in the Trigger Dependent User Info field in the Location variant HEz Uplink Sounding Trigger frame to the TBD (pre-determined) value to indicate that a new LTF Sequence Generation information is needed.~~

A RSTA that sends a Ranging Secure Sounding Trigger frame to an ISTA shall set:

— The SAC subfield in the Trigger Dependent User Info field in the STA Info field corresponding to AID/RID of the ISTA in the Ranging Secure Sounding Trigger frame to the same value as in the LTF Generation SAC field in the Secure LTF Parameters field in the last transmitted Fine Timing Measurement frame or last transmitted Location Measurement Report frame to the ISTA, if the RSTA has not sent any Ranging Secure Sounding Trigger frame to the ISTA after the last transmitted Fine Timing Measurement frame or last transmitted Location Measurement Report frame to the ISTA;

— Otherwise the SAC subfield in the Trigger Dependent User Info field in the STA Info field corresponding to AID/RID of the ISTA in the Ranging Secure Sounding Trigger frame to the TBD (pre-determined) value to indicate that a new LTF Sequence Generation information is needed.

The RSTA shall set the UL Rep subfield of the STA Info field corresponding to AID/RID of the ISTA in the Ranging Secure Sounding Trigger frame to the the Max UL Rep subfield value in the Ranging Parameters field in the last transmitted Fine Timing Measurement frame from the RSTA to the ISTA.

~~If the RSTA successfully receives an UL NPD a SIFS after the Location variant HEz Uplink Sounding Trigger frame, the RSTA shall respond with a Ranging NDP Announcement frame followed after a SIFS by a DL NDP and followed after a SIFS by a Location Measurement Report frame, where the Location Measurement Report frame shall contain a Secure LTF Parameters field with a new LTF Generation SAC and a new LTF Sequence Generation Information associated with the LTF Generation SAC. Otherwise, the RSTA shall follow the rules in 10.22.2.2 (EDCA backoff procedure) as the frame exchange is not successful, and it shall discard a current LTF Generation SAC and its associated LTF Sequence Generation Information stored at the RSTA.~~

~~The RSTA determines the LTF sequence of the UL NDP and the LTF sequence of the DL NDP with the LTF Sequence Generation Information in the Secure LTF Parameters field in the most recently transmitted an initial Fine Timing Measurement frame or a Location Measurement Report frame that is associated with the LTF Generation SAC subfield in the Trigger Dependent User Info field in the transmitted Location variant HEz Uplink Sounding Trigger frame, except when the LTF Generation SAC subfield in the Trigger Dependent User Info field in the transmitted Location variant HEz Uplink Sounding Trigger frame is equal to the TBD (pre-determined) value to indicate that a new LTF Sequence Generation information is needed. In which case, the LTF sequence of the UL NDP and the LTF sequence of the DL NDP are determined to the TBD (pre-determined) sequence.~~

~~NOTE1 – TBD (pre-determined) sequence is not suitable for a range measurement.~~

After transmission of the Ranging Secure Sounding Trigger frame to the ISTA, the RSTA’s MAC sublayer shall issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_SEQUENCE that is set to as follows:

— TBD (pre-determined), if the SAC subfield in the Trigger Dependent User Info field in the Ranging Secure Sounding Trigger frame to the TBD (pre-determined) value.

— Otherwise the LTF sequence generation information in the Secure LTF Parameters field in the the last transmitted Fine Timing Measurement frame or last transmitted Location Measurement Report frame to the ISTA.

When the RSTA receives the HE TB Ranging NDP PPDU from the ISTA, the RSTA shall:

1. Send a Ranging NDP Announcement frame.
2. Send an HE Ranging NDP PPDU with the TXVECTOR parameter LTF\_SEQUENCE set to as follows:

— TBD (pre-determined), if the SAC subfield in the Trigger Dependent User Info field in the Ranging Secure Sounding Trigger frame to the TBD (pre-determined) value.

— Otherwise the LTF sequence generation information in the Secure LTF Parameters field in the the last transmitted Fine Timing Measurement frame or last transmitted Location Measurement Report frame to the ISTA.

1. Send a Location Measurement Report frame that includes the Secure LTF Parameters field to the ISTA.

Otherwise, the RSTA shall follow the rules in 10.22.2.2 (EDCA backoff procedure) as the frame exchange is not successful.

The RSTA that sends the Ranging NDP Announcement frame shall set the Offset subfield in the STA Info field corresponding to AID/RID of the ISTA in the Ranging NDP Announcement frame to values meeting the Equation (11-aa):

(11-aa)

where

*Offsetn* represents the Offset subfield value of *nth* STA Info field in the Ranging NDP Announcement frame.

*N\_LTFn* represents the number of HE-LTF symbols required for the DL N\_STS subfield value plus 1 space-time streams of *nth* STA Info field in the Ranging NDP Announcement frame.

*Repn* represents the DL Rep subfield value plus 1 of *nth* STA Info field in the Ranging NDP Announcement frame.

*MinOffset* represents the set of indexes of the STA Info fields of which the Offset subfield values are less than the Offset subfield value of *ith* STA Info field in the Ranging NDP Announcement frame.

*MaxOffset* represents the set of indexes of all STA Info fields excluding *ith* STA Info field.

The RSTA shall set the DL Rep subfield of the STA Info field corresponding to AID/RID of the ISTA in the Ranging NDP Announcement frame to the Max DL Rep subfield value in the Ranging Parameters field in the last transmitted Fine Timing Measurement frame from the RSTA to the ISTA.

~~When an ISTA receives a Location variant HEz Uplink Sounding Trigger frame and a value of the LTF Generation SAC subfield in the Trigger Dependent User Info field in the Location variant HEz Uplink Sounding Trigger frame is equal to a value of the LTF Generation SAC subfield in the Secure LTF Parameters field stored at the ISTA, the ISTA determines the LTF sequence of an UL NDP transmitted a SIFS after the Location variant HEz Uplink Sounding Trigger frame and LTF sequence of a DL NDP received a SIFS after a Ranging NDP Announcement frame with the LTF Sequence Generation Information associated with the value of the LTF Generation SAC subfield in the Trigger Dependent User Info field in the Location variant HEz Uplink Sounding Trigger frame. The ISTA discards a current LTF Generation SAC and its associated LTF Sequence Generation Information stored at the ISTA.~~

When an ISTA receives a Ranging Secure Sounding Trigger frame from a RSTA in which the value of the SAC subfield in the Trigger Dependent User Info field is equal to the value of the LTF Generation SAC subfield in the Secure LTF Parameters field in the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA, the ISTA shall:

1. Send an HE TB Ranging NDP PPDU with the TXVECTOR parameter LTF\_SEQUENCE set to the LTF sequence generation information in the Secure LTF Parameters field in the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA;
2. Issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_SEQUENCE that is set to the LTF sequence generation information in the Secure LTF Parameters field in the the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA;

~~When an ISTA receives a Location variant HEz Uplink Sounding Trigger frame and a value of the LTF Generation SAC subfield in the Trigger Dependent User Info field in the Location variant HEz Uplink Sounding Trigger frame is not equal to a value of the LTF Generation SAC subfield in the Secure LTF Parameters field stored at the ISTA, the ISTA determines the LTF sequence of an UL NDP transmitted a SIFS after the Location variant HEz Uplink Sounding Trigger frame and LTF sequence of a DL NDP received a SIFS after a Ranging NDP Announcement frame to TBD (pre-determined) sequence or any other LTF sequence and discards a current LTF Generation SAC and its associated LTF Sequence Generation Information stored at the ISTA.~~

When an ISTA receives a Ranging Secure Sounding Trigger frame from a RSTA in which the value of the SAC subfield in the Trigger Dependent User Info field is not equal to the value of the LTF Generation SAC subfield in the Secure LTF Parameters field in the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA, the ISTA shall:

1. Send an HE TB Ranging NDP PPDU with the TXVECTOR parameter LTF\_SEQUENCE set to either TBD (pre-determined) sequence or the LTF sequence generation information in the Secure LTF Parameters field in the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA;
2. Issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_SEQUENCE that is set to either TBD (pre-determined) sequence or the LTF sequence generation information in the Secure LTF Parameters field in the the last received Fine Timing Measurement frame or last received Location Measurement Report frame from the RSTA;

When an ISTA receives a Ranging NDP Announcement frame from a RSTA in which the AID11/RID11 subfield in the STA Info field contains the 11 least significant bits of the AID or RID of the ISTA, the ISTA shall:

1. Issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_OFFSET that is set to the Offset subfield value in the STA Info field;
2. Issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_N\_STS that is set to the DL N\_STS subfield value in the STA Info field;
3. Issue a PHY-RXLTFSEQUENCE.request primitive with a LTFVECTOR parameter LTF\_REP that is set to the DL Rep subfield value in the STA Info field;

When a Location Measurement Report frame contains range measurement results ~~calculated~~ measured from an UL NDP and a DL NDP ~~that have a secure LTF sequence suitable for a range measurement~~, a RSTA that transmits the Location Measurement Report frame shall include the Secure LTF Parameters field in the Location Measurement Report frame and set ~~a value of~~ the Range Measurement SAC subfield in the Secure LTF Parameters field in the Location Measurement Report frame to the same value as in the ~~LTF Generation~~ SAC subfield in the Trigger Dependent User Info field in the ~~Location variant HEz Uplink~~ Ranging Secure Sounding Trigger frame that solicited the UL NDP and the DL NDP.

When an RSTA sending an HE Ranging NDP PPDU sets the TXVECTOR parameter LTF\_SEQUENCE to TBD, the RSTA shall not use the ToD value of HE Ranging NDP PPDU for the range measurement.

When a RSTA receiving an HE TB Ranging NDP PPDU sets the LTFVECTOR parameter in the PHY-RXLTFSEQUENCE.request primitive to TBD, the RSTA shall not use the ToA value of the HE Ranging NDP PPDU and set the Invaild Measurement Indication subfield to 1 in the ToA Error field in the Location Measurement Report carrying the ToA value of the HE TB Ranging NDP PPDU.

When an ISTA sending an HE TB Ranging NDP PPDU sets the TXVECTOR parameter LTF\_SEQUENCE to TBD, the ISTA shall not use the ToD value of HE TB Ranging NDP PPDU for the range measurement.

When an ISTA receiving an HE Ranging NDP PPDU sets the LTFVECTOR parameter in the PHY-RXLTFSEQUENCE.request primitive to TBD, the ISTA shall not use the ToA value of the HE Ranging NDP PPDU, and set the Invaild Measurement Indication subfield to 1 in the ToA Error field in the Location Measurement Report carrying the ToA value of the HE Ranging NDP PPDU if the Location Measurement Report transmission from the ISTA was negotiated.

***TGaz Editor: Insert the following paragraph after the first paragraph of the subclause 11.22.6.4.6.1 (Secure Non-TB ranging mode):***

The ISTA shall set the UL Rep subfield and DL Rep subfield of the STA Info field in the Ranging NDP Announcement frame to the the Max UL Rep subfield value and the Max DL Rep subfield value in the Ranging Parameters field in the last received Fine Timing Measurement frame from the RSTA.

***TGaz Editor: Change the subclause 28.2.3a as follows:***

* + 1. **TXVECTOR and RXVECTOR parameters**

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| ~~Table 21—~~Table 28-1—TXVECTOR and RXVECTOR parameters | | | | |
| Parameter | Condition | Value | TXVECTOR | RXVECTOR |
| LTF\_SEQUENCE | FORMAT is either HE\_SU or HE\_TB and APEP\_LENGTH is 0 | Indicates the LTF sequence generation information to make the randomized LTF sequence used in the HEz sounding NDP PPDU.  The LTF sequence generation information is defined in 9.4.2.251 (Secure LTF Parameters). | O | N |
| Otherwise | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). | | |
| LTF\_OFFSET | FORMAT is HE\_SU and APEP\_LENGTH is 0 | Indicates the number of HE-LTF to skip to receive in the following HE Ranging NDP PPDU.  Set to a value in the range 0 to 63. | O | N |
| Otherwise | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). | | |
| LTF\_N\_STS | FORMAT is either HE\_SU or HE\_TB and APEP\_LENGTH is 0 | Indicate the number of space-time streams to receive in the following HE Ranging NDP PPDU or the following HE TB Ranging NDP PPDU.  Set to the number of space-time streams minus 1. | O | N |
| Otherwise | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). | | |
| LTF\_REP | FORMAT is either HE\_SU or HE\_TB and APEP\_LENGTH is 0 | Indicate the number of repetitions of the HE-LTF symbols to receive in the following HE Ranging NDP PPDU or the following HE TB Ranging NDP PPDU.  Set to the number of repetitions minus 1. | O | N |
| Otherwise | See corresponding entry in Table 21-1 (TXVECTOR and RXVECTOR parameters). | | |

***TGaz Editor: Change the subclause 28.2.3a as follows:***

28.2.3a LTFVECTOR parameters

The LTFVECTOR is carried in a PHY-RXLTFSEQUENCE.request for PHY of ~~AP~~STA to receive the ~~secure HEz sounding NDP PPDU~~ HE Ranging NDP PPDU and the HE TB Ranging NDP PPDU. The parameters in Table 28-2a (LTFVECTOR parameters) are defined as part of the LTFVECTOR parameter list in the PHY-RXLTFSEQUENCE.request primitive.

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| ~~Table 1—~~Table 28-2a—LTFVECTOR parameters | |
| Parameter | Value |
| LTF\_SEQUENCE | Indicates the LTF sequence generation information to make the randomized LTF sequence used in the ~~HEz sounding NDP PPDU~~ HE Ranging NDP PPDU and HE TB Ranging NDP PPDU.  The LTF sequence generation information is defined in 9.4.2.251 (Secure LTF Parameters). |
| LTF\_OFFSET | Indicates the number of HE-LTF to skip to receive in the following HE Ranging NDP PPDU. |
| LTF\_N\_STS | Indicate the number of space-time streams to receive in the following HE Ranging NDP PPDU or the following HE TB Ranging NDP PPDU. |
| LTF\_REP | Indicate the number of repetitions of the HE-LTF symbols to receive in the following HE Ranging NDP PPDU or the following HE TB Ranging NDP PPDU. |