IEEE P802.11
Wireless LANs

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| Comment Resolution – CID 8008-8009 |
| Date: 2022-07-12 |
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Abstract

This submission proposes and edit to the comment resolution of CIDs 8008, 8009; as part of SA1, changes are relative to Draft 5.0

Revisions:

1. Added document links in the resolution box; Added changes to subclauses 27.3.10 and 27.3.11.1
2. Added feedback by Youhan and added two co-authors

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.**

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| **8008** | 237.12 | 27.3.10 | "that is not an HE Ranging NDP with secure HE-LTF" - grammatically the subclause is confusing (it removes one HE SU PPDU, but could be read to also exclude HE MU PPDU, etc). On a techincal level, excluding HE Ranging NDPs with secure HE-LTF from the whole mathematical section is maybe not what is intended. More so the secure HE-LTF are not described in the mathematical section, while all other parts of the frame, e.g., HE-STF \*are\* generated according to the mathematical section. | Remove, replace by a statement somewhere that an HE-LTF field with secure HE-LTF is not described/does not follow the mathematical description of HE-LTF (or add such a mathematical description). | **Revised**TGaz editor, see changes in document:<https://mentor.ieee.org/802.11/dcn/22/11-22-1138-02-00az-comment-resolution-cid-8008-8009.docx> |
| **8009** | 237.3 | 27.3.11.11 | "See 27.3.18a.1 and 27.3.18a.2 for HE preamble for HE Ranging NDP and HE TB Ranging NDP respectively." - HE Ranging NDPs use most parts of the HE Preamble normally as described here, it doesn't seem to make sense to exclude them fully here. | Remove, replace by a statement somewhere that an HE-LTF field with secure HE-LTF is not described/does not follow the mathematical description of HE-LTF (or add such a mathematical description). | **Revised**TGaz editor, see changes in document:<https://mentor.ieee.org/802.11/dcn/22/11-22-1138-02-00az-comment-resolution-cid-8008-8009.docx> |
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***TGaz Editor: Change the paragraph on page 235 at line 5 as follows***

27.3.10 Mathematical description of signals

***Change the paragraphs before and after Equation (27-3) as follows.***

In an HE SU PPDU, HE MU PPDU and HE ER SU PPDU, for each field excluding the PE field,  is defined as the summation of one or more subfields. Each subfield, , is defined to be an inverse discrete Fourier transform in Equation (27-3). In an HE TB PPDU, transmitted by user *u* in the *r*-th occupied RU, each subfield, , is defined in Equation (27-4).

***TGaz Editor: Change the paragraph on page 235 at line 16 as follows***

* + - * 1. 27.3.11.1 Introduction

***Change as follows.***

The HE preamble consists of pre-HE modulated fields and HE modulated fields. The pre-HE modulated fields for the various HE PPDU formats are the following:

* L-STF, L-LTF, L-SIG, RL-SIG and HE-SIG-A fields of an HE SU PPDU, HE ER SU PPDU and HE TB PPDU
* L-STF, L-LTF, L-SIG, RL-SIG, HE-SIG-A and HE-SIG-B fields of an HE MU PPDU

The HE modulated fields in the preamble for all HE PPDU formats are the HE-STF and HE-LTF fields.

See 27.3.18b for the description of the HE-LTF field using secure HE-LTF in the preamble of HE Ranging NDP and HE TB Ranging NDP.

1. ***TGaz Editor: Insert the new subclause 27.3.18b page 243 at line 10 after 27.3.18a.2 as follows***
	* + - 1. 27.3.18b HE-LTF field using secure HE-LTF

The HE-LTF field using secure HE-LTF is largely like the HE-LTF field, see 27.3.11.10 (HE-LTF field), the main differences are as follows: **(#3215, #3354, #3911, #3920, #4018**, #**5217)**

* The HE-LTF sequence is replaced by the randomized LTF sequence described in [[27.3.18b.1](#H27o3o18ao3)](#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 pseudorandom and deterministic phase rotation applied to all the subcarriers.
* A frequency domain flat top window is applied to the secure HE-LTF when configured.
* Only 2x HE-LTF and 1.6 µs GI is supported.
* No beamforming is applied; Q is a square identity matrix.

***TGaz Editor: Change the subclause 27.3.18a.3 (Generation of a randomized secure HE-LTF sequence) to 27.3.18b.1***

***TGaz Editor: Change the subclause 27.3.18a.5 (Pseudorandom and deterministic per spatial stream phase rotations) to 27.3.18b.2***

***TGaz Editor: Insert the new subclause 27.3.18b.3 page 248 at line 19 after 27.3.18a.3 as follows***

* + - * 1. 27.3.18b.3 Frequency domain windowing in HE-LTF field using secure HE-LTF
1. In an HE Ranging NDP or HE TB Ranging NDP using secure HE-LTF a frequency domain windowing function is applied to the subcarriers modulated with the secure HE-LTF sequence .
2. There are two frequency domain windowing functions defined, the rectangle window and the flat top window defined as follows:

 (27-126d)

where is the set of non-zero subcarriers for a given bandwidth defined in 27.3.18b.1 (Generation of a randomized secure HE-LTF sequence),
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.

***TGaz Editor: Insert the new subclause 27.3.18b.3 page 248 at line 19 after 27.3.18b.3 as follows***

* + - * 1. 27.3.18b.4 Mathematical description of HE-LTF field using secure HE-LTF

In an HE Ranging NDP or HE TB Ranging NDP using secure HE-LTF, the time domain representation of the waveform of user *u*, transmitted on transmitted on frequency segment and transmit chain shall be as described by Equation (27-126x).

(27-126x)

The equation above uses the following notation:

is the set of non-zero subcarriers for a given bandwidth defined in 27.3.18b.1 (Generation of a randomized secure HE-LTF sequence)

is the number of spatial streams for user *u*

is the number of HE-LTF repetitions for user *u*

is the number of HE-LTF symbols in one Repetition Block of user *u*

is the zero power GI windowing function, that avoids cyclic extension of the signal outside of

is always set to

is always set to 1.6, accordingly

is an identity matrix, i.e., .

is defined in Equation (27-57)

is the frequency domain windowing function

is the *k*th subcarrier of the 64-QAM modulated secure HE-LTF sequence for user *u*

is the total phase rotation applied to spatial stream m within repetition 𝑟+1 for user *u*, defined in Equation (27-126f)

The time domain representation of the waveform including all users, transmitted on frequency segment and transmit chain shall be as described by as:

where is the total number of users (NUM\_USERS) and is the start time of the secure HE-LTF symbols for user *u*:

and .

***TGaz Editor: Change the subclause 27.3.18a.4 (Construction of a secure HE-LTF) to 27.3.18b.5***

***TGaz Editor: Change the following paragraphs on page 248 at line 20 after as follows***

* + - * 1. 27.3.18b.5 Construction of a secure HE-LTF

The construction of the k-th Secure HE-LTF symbol is as follows:

1. Sequence generation: Construct the k-th randomized HE-LTF sequence in frequency domain over the bandwidth indicated by CH\_BANDWIDTH as described in 27.3.18b.1 (Generation of Randomized LTF Sequence).
2. Apply per spatial stream phase rotation: Generate the pseudorandom phase rotation for each spatial stream. Apply the pseudorandom phase rotation along with the deterministic phase rotation to the spatial streams as described in 27.3.18b.2 (Pseudorandom and deterministic per spatial stream phase rotations).
3. Apply frequency domain window function to all the tones of the secure HE-LTF sequence. The frequency domain window can be the Rectangular window or flat top window, when the TXVECTOR parameter TX\_WINDOW\_FLAG is set to 0 or 1 respectively.
4. There is no CSD per space-time stream.
5. There is no spatial mapping, the Q matrix is a square identity matrix.
6. IDFT: Compute the inverse discrete Fourier transform.
7. Insert zero power GI: Prepend values of zero of length indicated by the TXVECTOR parameter GI\_TYPE.
8. 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 27.3.10 (Mathematical description of signals).