IEEE P802.11  
Wireless LANs

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | LB253 Misc Comments | | | | | | Date: 2021-05-12 | | | | | | Author(s): | | | | | | Name | Affiliation | Address | Phone | email | | Youhan Kim | Qualcomm |  |  | [youhank@qti.qualcomm.com](mailto:youhank@qti.qualcomm.com) | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |

Abstract

This submission proposes resolutions for the following comments from comment collection on P802.11az D3.0:

5473, 5460, 5461, 5463, 5467, 5468, 5474, 5469, 5471

NOTE – Set the Track Changes Viewing Option in the MS Word to “All Markup” to clearly see the proposed text edits.

**Revision History:**

R0: Initial version.

R1: Updated during 5/12/2021 TGaz meeting

# CID 5473

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5473 | 27.1.1 | 218.19 | It is not mandatory for HE STAs to support Ranging NDPs.  Furthermore, most of the other optional HE features have capability bit(s) in the HE Capabilities element, but the support for Ranging NDP is indicated elsewhere, which would be confusing to readers.  So, we should add a note explaining where to find the 'capability' indicating whether Ranging NDP is supported or not. | Add to 11ax D8.0 P497L32: "(An HE STA may support the following features:) ... - HE Ranging NDP (transmit and receive) - HE TB Ranging NDP (transmit and receive)  NOTE - Support for HE Ranging NDP and HE TB Ranging NDP is indicated in the Extended Capabilities element." |

**Discussion**

Support for Ranging NDPs is optional for HE STAs as the commenter has noted. In 11ax D8.0, subclause 27.1.1 (Introduction to the HE PHY) lists mandatory and optional features of HE STA. Hence, Ranging NDP should be added there as well.

Furthermore, while all other optional HE features are indicated in the HE Capabilities element, the support for Ranging NDPs is indicated in the Extended Capabilities element. Hence, it is worth noting that information so that readers can easily find the relevant capability.

**Proposed Resolution: CIDs 5473**

**Revised**.

**Note to Commenter:**

The instruction to Editor below implements the proposed change by the commenter, but using a more appropriate editing instruction.

**Instruction to TGaz Editor:**

Make the changes as shown in [https://mentor.ieee.org/802.11/dcn/21/11-21-0811-01-00az-lb253-misc-comments.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0811-00-00az-lb253-misc-comments.docx)

**Proposed Text Updates: CIDs 5473**

*Instruction to TGaz Editor: Insert the following text at D3.0 P218, between L18 and L19.*

**27.1 Introduction**

**27.1.1 Introduction to the HE PHY**

***Change the paragraph 12 as follows.***

An HE STA may support the following features:

* HE-MCSs 8 to 11 (transmit and receive).
* Two or more spatial streams (transmit and receive).
* DCM (transmit and receive).
* HE SU PPDUs and HE ER SU PPDUs with a 1x HE-LTF(#24512) and 0.8 µs GI duration on the HE-LTF and Data field OFDM symbols (transmit and receive).
* HE SU PPDUs with a 4x HE-LTF and 0.8 µs GI duration on the HE-LTF and Data field OFDM symbols if the STA does not support HE ER SU PPDUs with a 4x HE-LTF and 0.8 µs GI duration on both the HE-LTF and Data field OFDM symbols (transmit and receive).
* HE ER SU PPDUs with a 4x HE-LTF and 0.8 µs GI duration on both the HE-LTF and Data field OFDM symbols (transmit and receive).
* LDPC coding (transmit and receive) if the maximum number of spatial streams the STA is capable of transmitting or receiving in an HE SU PPDU is less than or equal to 4.
* Single spatial stream HE-MCS 0 in the higher frequency 106-tone RU of the primary 20 MHz channel for an HE ER SU PPDU.
* STBC (transmit and receive).
* HE Ranging NDP (transmit and receive)
* HE TB Ranging NDP (transmit and receive)

NOTE - Support for HE Ranging NDP and HE TB Ranging NDP are indicated in the Extended Capabilities element.

# CID 5460

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5460 | 27.2.2 | 221 | Why do HE ER SU and HE MU PPDU require to have a RANGING\_FLAG?  Neither HE Ranging NDP nor HE TB Ranging NDP are based on HE ER SU or HE MU PPDU. | Remove HE\_ER\_SU and HE\_MU from PPDU formats have the RANGING\_FLAG TXVECTOR. |

**Background**

D3.0 P221

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D3.0 P224

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D3.0 P226

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**Proposed Resolution: CIDs 5460**

**Revised**.

**Note to Commenter:**

HE Ranging NDP uses the HE SU PPDU format (D3.0 P224L12) and HE TB Ranging NDP uses the HE TB PPDU format (D3.0 P226L20). Hence the commenter is correct that HE ER SU and HE MU PPDU formats should not have TXVECTOR parameter RANGING\_FLAG.

Furthermore, Table 19-1 and Table 21-1 do not have TXVECTOR parameter RANGING\_FLAG. Hence, the “otherwise” row is also incorrect.

**Instruction to TGaz Editor:**

Make the changes as shown in [https://mentor.ieee.org/802.11/dcn/21/11-21-0811-01-00az-lb253-misc-comments.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0811-00-00az-lb253-misc-comments.docx)

**Proposed Text Updates: CIDs 5460**

*Instruction to TGaz Editor: Update D3.0 P221 as shown below.*

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| --- | --- | --- | --- | --- |
| RANGING\_FLAG | FORMAT is HE\_SU | Indicate whether the PPDU is a HE Ranging NDP. Set to 1 when the PPDU is a HE Ranging NDP. Set to 0 otherwise. | MU | N |
| FORMAT is HE\_TB | Indicate whether the PPDU is a HE TB Ranging NDP. Set to 1 when the PPDU is a HE TB Ranging NDP. Set to 0 otherwise. | MU | N |
|  |  | | |
| Otherwise | Not Present | N | N |

# CID 5461

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5461 | 27.2.2 | 221 | "HE NDP" should be "HE sounding NDP". | Change "HE NDP" in PSDU\_LENGTH row to "HE sounding NDP" |

**Discussion**

11az D3.0 P221

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11ax D8.0 P510

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Commenter is correct that “HE sounding NDP” is the correct term per 11ax D8.0 P510L12.

**Proposed Resolution: CIDs 5461**

**Accepted**.

# CID 5463

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5463 | 27.2.2 | 221 | Nothing has changed in NUM\_STS compared to baseline. | Delete the row for NUM\_STS on both P221 and 222. |

**Discussion**

11az D3.0 P221

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11ax D8.0 P224

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Commenter is correct that 11az has not added anything on top of 11ax D8.0 regarding NUM\_STS (other than the fact that 11az forgot to copy the NOTE for HE\_ER\_SU from 11ax D8.0).

**Proposed Resolution: CIDs 5463**

**Accepted**

# CID 5467

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5467 | 27.3.18a | 225.15 | 27.3.11.10 does not define 'insecure' HE-LTFs. | Change "insecure HE-LTFs as defined in Subclause 27.3.11.10 (HE-LTF) are used in the HE Ranging NDP"  to  "HE-LTF as defined in Subclause 27.3.11.10 (HE-LTF) are used as insecure HE-LTF in the HE Ranging NDP"  Also, at P233L8, change "The Secure HE-LTF field is largely like the insecure HE-LTF field defined in 27.3.11.10 (HE-LTF)" to "The Secure HE-LTF field is largely like the HE-LTF field defined in 27.3.11.10 (HE-LTF)" |

**Discussion**

11az D3.0 does not edit 27.3.11.10. And 27.3.11.10 in 11ax D8.0 does not talk about ‘insecure’ HE-LTF. Hence the commenter is correct that it is inaccurate to say that 27.3.11.10 defines the insecure HE-LTF.

Following is the redline version of the proposed text change by the commenter for ease of review by the readers.

11az D3.0 P221

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| When the TXVECTOR parameter LTF\_KEY is not present, HE-LTFs as defined in Subclause 27.3.11.10 (HE-LTF) are used as insecure HE-LTF in the HE Ranging NDP. |

11az D3.0 P221

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| 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: |

**Proposed Resolution: CIDs 5467**

**Revised**

**Note to Commenter:**

Agree with the comment. The issue has already been addressed in CID 5217.

**Note to Editor:**

No further draft text change is needed by this CID as the issue has been addressed in CID 5217.

# CID 5468

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5468 | 27.3.18a | 225.15 | If you read through 27.3.18a, a lot of things described in 27.3.10 and 27.3.11 does not apply to Ranging NDPs.  For example,  the mathematical equations all assume GI has non-zero energy, while secure NDPs have no energy.  HE-LTF in 27.3.11.10 has per-stream CSD, but secure NDP does not have per-stream CSD.  # of LTF symbols described in Table 21-13 (referenced in 27.3.11.10) does not hold for Ranging NDPs due to the repetition.  Definition of HE-SIG-A in 27.3.11.7 is not accurate for Ranging NDPs - they are described in 27.3.18a/b.  Waveform equations do not contain any frequency domain windowing, while Ranging NDPs do.  HE-LTF sequence for secure Ranging NDPs are different from those in 27.3.11.10. etc.  So, there should be some disclaimers written to alert the readers that Ranging NDPs are defined elsewhere. | At the end of 27.3.11.1, add  "See 27.3.18a and 27.3.18b for HE preamble for HE Ranging NDP and HE TB Ranging NDP." |

**Discussion**

Following is the 11ax subclause structure, where 27.3.10 is the Mathematical description of signals and 27.3.11 is the HE preamble.

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The commenter wrote:

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| the mathematical equations all assume GI has non-zero energy, while secure NDPs have no energy. |

This is true. For example, 11ax D8.0 Equations (27-3) and (27-4) (11ax D8.0 P570L29, 27.3.10) is the ‘main’ equation describing the transmit waveform of all fields of HE PPDUs (from L-STF to Data fields).

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Note that these equations have non-zero energy transmitted during the GI, which is not the case for secure Ranging NDPs.

The commenter also wrote:

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| HE-LTF in 27.3.11.10 has per-stream CSD, but secure NDP does not have per-stream CSD. |

I.e., 11ax D8.0 P633L64 has

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| … |

And 27.3.11.2.2 points to Table 21-11, which can be found at REVme D0.0 P3157L9:

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Clearly, the CSD values when Nss is greater than 1 is non-zero, which is not the case for secure NDPs.

All the other examples given by the commenter is correct as well, but will not be repeated here. And there are many other examples where 27.3.10 and 27.3.11 do not apply to Ranging NDPs.

Furthermore, Ranging NDPs are described in 27.3.18a and 27.3.18b, including the mathematical description, CSD, etc.

Hence, it is appropriate as the commenter has pointed out to indicate that 27.3.10 and 27.3.11 do not accurately represent Ranging NDPs.

**Proposed Resolution: CIDs 5468**

**Revised**.

**Note to Commenter:**

Agree with the commenter that 27.3.10 and 27.3.11 do not accurately represent Ranging NDPs, which are described separately in 27.3.18a and 27.3.18b. The instruction to Editor below adds the text proposed by the commenter in 27.3.11, as well as adding a similar language at 27.3.10.

**Instruction to TGaz Editor:**

Make the changes as shown in [https://mentor.ieee.org/802.11/dcn/21/11-21-0811-01-00az-lb253-misc-comments.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0811-00-00az-lb253-misc-comments.docx)

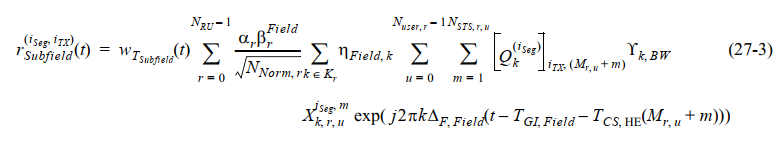
**Proposed Text Updates: CIDs 5468**

*Instruction to TGaz Editor: Insert the following text at D3.0 P224L6.*

**27.3.10 Mathematical description of signals**

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

In an HE SU PPDU that is not an HE Ranging NDP with secure HE-LTF, 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 that is not an HE TB Ranging NDP with secure HE-LTF, transmitted by user *u* in the *r*-th occupied RU, each subfield, , is defined in Equation (27-4).

**27.3.11 HE Preamble**

**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 27.3.18a and 27.3.18b for HE preamble for HE Ranging NDP and HE TB Ranging NDP.

# CID 5474

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5474 | 27.3.18a | 224.6 | It should be made clear that 27.3.18c, 27.3.18d, 27.3.18e and 27.3.18f only apply to Ranging NDPs. | - Create new subclause 27.3.18a with title "HE Ranging NDP and HE TB Ranging NDP" - Renumber existing 27.3.18a as 27.3.18a.1 (HE Ranging NDP) - Renumber 27.3.18b as 27.3.18a.2 (HE TB Ranging NDP) - Renumber 27.3.18c as 27.3.18a.3 (Generation of Randomized LTF Sequence) - Renumber 27.3.18d as 27.3.18a.4 (Construction of Secure HE-LTF) - Renumber 27.3.18e as 27.3.18a.5 (Pseudo random and ...) - Renumber 27.3.18f as 27.3.18a.6 (Time of departure accuracy for HE Ranging NDP and HE TB Ranging NDP)  At the beginning the new 27.3.18a (HE Ranging NDP and HE TB Ranging NDP), add the following sentence: "This subclause only applies to HE Ranging NDP and HE TB Ranging NDP." |

**Discussion**

Following is the current subclause structure of 27.3, where the RED subclauses are the ones added by 11az.

|  |
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| 27.3 HE PHY  27.3.1 Introduction  27.3.2 Subcarrier and resource allocation  27.3.3 MU-MIMO  27.3.4 HE PPDU formats  27.3.5 Transmitter block diagram  27.3.6 Overview of the PPDU encoding process  27.3.7 HE modulation and coding schemes (HE-MCSs)  27.3.8 HE-SIG-B modulation and coding schemes (HE-SIG-B-MCSs)  27.3.9 Timing-related parameters  27.3.10 Mathematical description of signals  27.3.11 HE preamble  27.3.12 Data field  27.3.13 Packet extension  27.3.14 Non-HT duplicate transmission  27.3.15 Transmit requirements for PPDUs sent in response to a triggering frame  27.3.16 SU-MIMO and DL MU-MIMO beamforming  27.3.17 HE sounding NDP  27.3.18 HE TB feedback NDP  27.3.18a HE Ranging NDP  27.3.18b HE TB Ranging NDP  27.3.18c Generation of Randomized LTF Sequence  27.3.18d Construction of Secure HE-LTF  27.3.18e Pseudo Random and Deterministic Per-Spatial Stream Phase Rotations  27.3.18f Time of departure accuracy  27.3.19 Transmit Specification  … |

Note that 27.3.1~27.3.16 apply to ‘regular’ HE PPDUs. With the addition of 27.3.18c~f, it is not clear whether these new clauses apply to the ‘regular’ HE PPDUs or not.

Commenter’s suggestion would result in the following subclause structure for 27.3, which clearly indicates that the ‘old’ 27.3.18c~f only apply to Ranging NDPs.

|  |
| --- |
| 27.3 HE PHY  27.3.1 Introduction  27.3.2 Subcarrier and resource allocation  27.3.3 MU-MIMO  27.3.4 HE PPDU formats  27.3.5 Transmitter block diagram  27.3.6 Overview of the PPDU encoding process  27.3.7 HE modulation and coding schemes (HE-MCSs)  27.3.8 HE-SIG-B modulation and coding schemes (HE-SIG-B-MCSs)  27.3.9 Timing-related parameters  27.3.10 Mathematical description of signals  27.3.11 HE preamble  27.3.12 Data field  27.3.13 Packet extension  27.3.14 Non-HT duplicate transmission  27.3.15 Transmit requirements for PPDUs sent in response to a triggering frame  27.3.16 SU-MIMO and DL MU-MIMO beamforming  27.3.17 HE sounding NDP  27.3.18 HE TB feedback NDP  27.3.18a HE Ranging NDP and HE TB Ranging NDP  27.3.18a.1 HE Ranging NDP  27.3.18a.2 HE TB Ranging NDP  27.3.18a.3 Generation of Randomized LTF Sequence  27.3.18a.4 Construction of Secure HE-LTF  27.3.18a.5 Pseudo Random and Deterministic Per-Spatial Stream Phase Rotations  27.3.18a.6 Time of departure accuracy  27.3.19 Transmit Specification  … |

**Proposed Resolution: CIDs 5474**

**Revised**.

**Note to Commenter:**

The instruction to Editor below implements the proposed change by the commenter, filling in some more details.

**Instruction to TGaz Editor:**

Make the changes as shown in [https://mentor.ieee.org/802.11/dcn/21/11-21-0811-01-00az-lb253-misc-comments.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0811-00-00az-lb253-misc-comments.docx)

**Proposed Text Updates: CIDs 5474**

*Instruction to TGaz Editor: Change D3.0 P224L7 as shown below.*

**27.3.18a HE Ranging NDP and HE TB Ranging NDP**

This subclause applies only to HE Ranging NDP and HE TB Ranging NDP.

**27.3.18a.1 HE Ranging NDP**

*Instruction to TGaz Editor: Change D3.0 P226L15 as shown below.*

**27.3.18a.2 HE TB Ranging NDP**

*Instruction to TGaz Editor: Change D3.0 P227L27 as shown below.*

**27.3.18a.3 Generation of Randomized LTF Sequence**

*Instruction to TGaz Editor: Change D3.0 P227L1 as shown below.*

**27.3.18a.3.1 Randomized LTF Sequence for 20-MHz secure NDP**

*Instruction to TGaz Editor: Change D3.0 P228L26 as shown below.*

**27.3.18a.3.2 Randomized LTF Sequence for 40-MHz secure NDP**

*Instruction to TGaz Editor: Change D3.0 P230L3 as shown below.*

**27.3.18a.3.3 Randomized LTF Sequence for 80-MHz secure NDP**

*Instruction to TGaz Editor: Change D3.0 P231L13 as shown below.*

**27.3.18a.3.4 Randomized LTF Sequence for 160-MHz secure NDP**

*Instruction to TGaz Editor: Change D3.0 P233L7 as shown below.*

**27.3.18a.4 Construction of Secure HE-LTF**

*Instruction to TGaz Editor: Change D3.0 P234L33 as shown below.*

**27.3.18a.5 Pseudo Random and Deterministic Per-Spatial Stream Phase Rotations**

# CID 5469

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5469 | 27.3.18f | 236.13 | These time of departure accuracy only apply to Ranging NDPs. | Change the subclause title from  "27.3.18f Time of departure accuracy"  To  "27.3.18f Time of departure accuracy for HE Ranging NDP and HE TB Ranging NDP". |

**Discussion**

27.3.18f (Time of departure accuracy) is a new subclause added by 11az. Ranging NDPs require such accuracy, but the ‘original’ HE PPDU do not.

**Proposed Resolution: CIDs 5469**

**Rejected**

HE PPDU can be used for EDCA based FTM in the 6 GHz band, which requires time of departure accuracy.

# CID 5471

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** |
| 5471 | 27.3.22 | 238.15 | Ranging NDPs itself does not have information which allows receivers to identify them as Ranging NDPs. Rather, the Ranging NDPs rely on previous packets to inform the intended receivers that the next packet is a Ranging NDP. Hence, the receive procedure in 27.3.22 does not apply to Ranging NDPs. | - Define a primitive for a receiver MAC to inform its PHY to expect Ranging NDP as the next packet. - Add language in Clause 26 that when MAC receives the 'prior packet', then MAC issues that primitive to PHY to make it prepare to receive the Ranging NDP - Add language in 27.3.22 that the receiver procedure described in 27.3.22 does not apply to the case when PHY is receiving the first PPDU after 'that' primitive has been received from MAC.  Or, at the very least, add the following sentence at the beginning of 27.3.22. "Receive procedure described in this subclause does not apply when receiving HE Ranging NDP or HE Ranging TB NDP." |

**Discussion**

27.3.22 (HE receive procedure) describes how the receiver ‘navigates’ through various PPDU types as it discovers them (e.g. RL-SIG detection, QBPSK detection, etc.) as well as various behaviors when ‘checks’ fail. For example, the state machine in Figure 27-63 is a center-piece of 27.3.22, but clearly does not describe how Ranging NDPs are received.

11ax D8.0 P696:

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**Proposed Resolution: CIDs 5471**

**Revised**.

**Note to Commenter:**

Agree with the commenter that the receive procedure in 27.3.22 does not consider Ranging NDPs. The instruction to Editor below implements the second suggestion by the commenter.

**Instruction to TGaz Editor:**

Make the changes as shown in [https://mentor.ieee.org/802.11/dcn/21/11-21-0811-01-00az-lb253-misc-comments.docx](https://mentor.ieee.org/802.11/dcn/21/11-21-0811-00-00az-lb253-misc-comments.docx)

**Proposed Text Updates: CIDs 5471**

*Instruction to TGaz Editor: Insert the following text at D3.0 P238L15.*

**27.3.22 HE receive procedure**

***Change the third paragraph as follows.***

This receive procedure and state machine do not describe the operation of optional features, such as DCM, HE Ranging NDP and HE TB Ranging NDP. If the detected format indicates a non-HT PPDU, refer to the receive procedure and state machine in Clause 15, Clause 16, Clause 17 and Clause 18. If the detected format indicates an HT PPDU format, refer to the receive procedure and state machine in Clause 19. If the detected format indicates a VHT PPDU format, refer to the receive procedure and state machine in Clause 21. Through station management (via the PLME) the PHY is set to the appropriate frequency, as specified in 27.4. The PHY has also been configured with BSS identification information and STA identification information (i.e., BSS color value and STA-ID in the BSS) so that it can receive data intended for the STA in the specific cell. Other receive parameters, such as RSSI and indicated DATARATE, may be accessed via the PHY-SAP.

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