IEEE P802.11  
Wireless LANs

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | D2.0 PHY Comment Resolution | | | | | | Date: 2018-01-15 | | | | | | Author(s): | | | | | | Name | Affiliation | Address | Phone | email | | Youhan Kim | Qualcomm | 1700 Technology Dr.  San Jose, CA 95110 |  | youhank@qti.qualcomm.com | |  |  |  |  |  | |

Abstract

This submission proposes resolutions for the following comments from the letter ballot on P802.11ax D2.0:

13427, 13433, 13441, 13430, 13429, 14050, 12878, 12686, 13612

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.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 13427 | 28.3.2 | 356.23 | The organization of the section looks wrong: - section 28.3.2 (MU transmission) only has one subsection (28.3.2.1 Introduction). - section 28.3.3 (OFDMA and SU tone allocation) looks like it belongs under 28.3.2 (MU). Renumber as 28.3.2.2 - section 28.3.3.9 (DL MU-MIMO) is a subsection of "OFDMA and SU tone allocation". It looks like it should be a subsection of 28.3.2 instead (MU transmission). Renumber as 28.3.2.3 - section 28.3.3.10 (UL MU transmission) is a subsection of "OFDMA and SU tone allocation". It looks like it should be a subsection of 28.3.2 instead (MU transmission).). Renumber as 28.3.2.4 - section 28.3.3.11 (UL MU-MIMO) is a subsection of "OFDMA and SU tone allocation". It looks like it should be a subsection of 28.3.2 instead (MU transmission).). Renumber as 28.3.2.5. | Reorganize as described |
| 13433 | 28.3.3.9 | 368.07 | Why is DL MU-MIMO a subsection of "OFDMA and SU allocation"? | Reorganize section |
| 13441 | 28.3.3.11 | 369.46 | Why is "UL MU-MIMO" a subsection of "OFDMA and SU tone allocation" | reorganize section |

**Discussion**

Following table compares the table of contents between D2.1 and the proposal by the commenter (ignore the various colors for now – used in discussion after the table). Essentially, 28.3.3~28.3.3.8 gets pushed down one level.

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| **D2.1** | **Proposal by the Commenter** |
| 28.3 HE PHY  28.3.1 Introduction  28.3.2 MU transmission  28.3.2.1 Introduction  28.3.3 OFDMA and SU tone allocation  28.3.3.1 General  28.3.3.2 Resource unit, guard and DC subcarriers  28.3.3.3 Null subcarriers  28.3.3.4 Pilot subcarriers  28.3.3.5 20 MHz operating non-AP HE STAs  28.3.3.6 RU restrictions for 20 MHz operation  28.3.3.7 80 MHz operating non-AP HE STAs  28.3.3.8 DL MU transmission  28.3.3.9 DL MU-MIMO  28.3.3.9.1 Supported RU sizes in DL MU-MIMO  28.3.3.9.2 Maximum number of spatial streams in an HE MU  28.3.3.10 UL MU transmission  28.3.3.11 UL MU-MIMO  28.3.3.11.1 Introduction  28.3.3.11.2 Supported RU sizes in UL MU-MIMO  28.3.3.11.3 MU-MIMO LTF Mode  28.3.3.11.4 maximum number of spatial streams in UL  28.3.3.11.5 Resource allocation for an HE TB PPDU  28.3.4 HE PPDU formats | 28.3 HE PHY  28.3.1 Introduction  28.3.2 MU transmission  28.3.2.1 Introduction  28.3.2.2 OFDMA and SU tone allocation  28.3.2.2.1 General  28.3.2.2.2 Resource unit, guard and DC subcarriers  28.3.2.2.3 Null subcarriers  28.3.2.2.4 Pilot subcarriers  28.3.2.2.5 20 MHz operating non-AP HE STAs  28.3.2.2.6 RU restrictions for 20 MHz operation  28.3.2.2.7 80 MHz operating non-AP HE STAs  28.3.2.2.8 DL MU transmission  28.3.2.3 DL MU-MIMO  28.3.2.3.1 Supported RU sizes in DL MU-MIMO  28.3.2.3.2 Maximum number of spatial streams in an HE MU  28.3.2.4 UL MU transmission  28.3.2.5 UL MU-MIMO  28.3.2.5.1 Introduction  28.3.2.5.2 Supported RU sizes in UL MU-MIMO  28.3.2.5.3 MU-MIMO LTF Mode  28.3.2.5.4 maximum number of spatial streams in UL  28.3.2.5.5 Resource allocation for an HE TB PPDU  28.3.3 HE PPDU formats |

While the commenter is correct that sections in 28.3.2 and 28.3.3 are not organized properly, there are additional changes needed on top of the suggestion by the commenter.

First, 28.3.3.8 (DL MU transmission) covers both DL OFDMA and DL MU-MIMO, but the proposal by commenter puts it as a subsection of DL OFDMA. More importantly, 28.3.3.8 (DL MU transmission) has only one sentence, which is already stated in 28.3.2.1 (Introduction).

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Similarly, 28.3.3.10 (UL MU transmission) has three sentences, two of which are already present in 28.3.2.1 (Introduction).

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Lastly, 28.3.3.11.5 (Resource allocation for an HE TB PPDU) applies to both UL OFDMA and UL MU-MIMO, but is currenly a subsection of UL MU-MIMO (28.3.3.11).

Hence, the proposed resolution is to:

* Move 28.3.3~28.3.3.7 down one level (make them subsections of 28.3.2) as suggested by the commenter
* Remove 28.3.3.8 (DL MU transmission)
  + Already covered in 28.3.2.1
* Move the second sentence from 28.3.3.10 (UL MU transmission) to 28.3.2.1 (Introduction). And then remove 28.3.3.10 (UL MU transmission).
* Move 28.3.3.11.5 (Resource allocation for an HE TB PPDU) up one level (i.e., pull it out from UL MU-MIMO)

The following table shows the resulting difference in the table of contents between D2.1 and the proposed resolution.

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| **D2.1** | **End Result of Proposed Resolution** |
| 28.3 HE PHY  28.3.1 Introduction  28.3.2 MU transmission  28.3.2.1 Introduction  28.3.3 OFDMA and SU tone allocation  28.3.3.1 General  28.3.3.2 Resource unit, guard and DC subcarriers  28.3.3.3 Null subcarriers  28.3.3.4 Pilot subcarriers  28.3.3.5 20 MHz operating non-AP HE STAs  28.3.3.6 RU restrictions for 20 MHz operation  28.3.3.7 80 MHz operating non-AP HE STAs  28.3.3.8 DL MU transmission  28.3.3.9 DL MU-MIMO  28.3.3.9.1 Supported RU sizes in DL MU-MIMO  28.3.3.9.2 Maximum number of spatial streams in an HE MU  28.3.3.10 UL MU transmission  28.3.3.11 UL MU-MIMO  28.3.3.11.1 Introduction  28.3.3.11.2 Supported RU sizes in UL MU-MIMO  28.3.3.11.3 MU-MIMO LTF Mode  28.3.3.11.4 maximum number of spatial streams in UL  28.3.3.11.5 Resource allocation for an HE TB PPDU  28.3.4 HE PPDU formats | 28.3 HE PHY  28.3.1 Introduction  28.3.2 MU transmission  28.3.2.1 Introduction  (Note: Move the second sentence from 28.3.3.10 UL MU transmission to 28.3.2.1.)  28.3.2.2 OFDMA and SU tone allocation  28.3.2.2.1 General  28.3.2.2.2 Resource unit, guard and DC subcarriers  28.3.2.2.3 Null subcarriers  28.3.2.2.4 Pilot subcarriers  28.3.2.2.5 20 MHz operating non-AP HE STAs  28.3.2.2.6 RU restrictions for 20 MHz operation  28.3.2.2.7 80 MHz operating non-AP HE STAs  (Note: Same wording is already present in 28.3.2.1 Introduction.)  28.3.2.3 DL MU-MIMO  28.3.2.3.1 Supported RU sizes in DL MU-MIMO  28.3.2.3.2 Maximum number of spatial streams in an HE MU  (Note: Out of two sentences, the first sentence is already in 28.3.2.1 Introduction. Move the second sentence to 28.3.2.1.)  28.3.2.4 UL MU-MIMO  28.3.2.4.1 Introduction  28.3.2.4.2 Supported RU sizes in UL MU-MIMO  28.3.2.4.3 MU-MIMO LTF Mode  28.3.2.4.4 maximum number of spatial streams in UL  28.3.3 Resource allocation for an HE TB PPDU  (Note: Move out from UL MU-MIMO because it applies to UL OFDMA as well)  28.3.4 HE PPDU formats |

**Proposed Resolution: CID 13427, 13433, 13441**

**Revised**. Agree with the commenter that the organization of sections under 28.3.2 and 28.3.3 are inadequate. The proposed resolution makes additional improvements on top of the proposal from the commenter.

Instruction to Editor: Implement the proposed text changes in 11-18/0057r0 under CID 13427, 13433, 13441.

**Proposed Text Updates: CID 13427, 13433, 13441**

*TGax Editor: Update D2.1 P358L36 as shown below.*

* Introduction

The MU transmissions include DL MU transmissions and UL MU transmissions.

DL MU transmission allows an AP to simultaneously transmit information to more than one non-AP STA. For a DL MU transmission, the AP uses the HE MU PPDU format and employs either DL OFDMA, DL MU-MIMO, or a mixture of both. UL MU transmission allows an AP to simultaneously receive information from more than one non-AP STA. UL MU transmissions for UL MU-MIMO and UL OFDMA are preceded by a Trigger frame from the AP. The non-AP STAs transmit using the HE TB PPDU format and employ either UL OFDMA, UL MU-MIMO, or a mixture of both.

*TGax Editor: Delete section 28.3.3.8 (D2.1 P370L5).*

*TGax Editor: Delete section 28.3.3.10 (D2.1 P371L40).*

*TGax Editor: Change the section numbers of 28.3.3~28.3.3.7 as shown below.*

28.3.2.2 OFDMA and SU tone allocation

28.3.2.2.1 General

28.3.2.2.2 Resource unit, guard and DC subcarriers

28.3.2.2.3 Null subcarriers

28.3.2.2.4 Pilot subcarriers

28.3.2.2.5 20 MHz operating non-AP HE STAs

28.3.2.2.6 RU restrictions for 20 MHz operation

28.3.2.2.7 80 MHz operating non-AP HE STAs

28.3.2.3 DL MU-MIMO

28.3.2.3.1 Supported RU sizes in DL MU-MIMO

28.3.2.3.2 Maximum number of spatial streams in an HE MU

28.3.2.4 UL MU-MIMO

28.3.2.4.1 Introduction

28.3.2.4.2 Supported RU sizes in UL MU-MIMO

28.3.2.4.3 MU-MIMO LTF Mode

28.3.2.4.4 maximum number of spatial streams in UL

28.3.3 Resource allocation for an HE TB PPDU

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 13430 | 28.3.3.2 | 364.30 | "A 2x996-tone RU consists of two 996-tone ...". It looks like this should be a separate paragraph at the same level as the paragraphs starting at lines 5, 17 and 26. | Strat new pargraph at "A 2x996-ton RU ..." |

**Discussion:**

D2.1 P366L30:

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As the commenter has indicated, each RU size is given a separate paragraph. Hence, to be consistent, the 2x996-tone RU should be given a separate paragraph (though it would result in a one line paragraph).

**Proposed Resolution: CID 13430**

**Accepted**.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 13429 | 28.3.3.3 | 364.65 | "The null subcarriers are located near the DC or edge tones to protect those tones near the DC or edge tones from the interference of a neighboring RU". Null carriers around DC are not intended for protection against neighboring RUs. There are no neighbors. | Clarify |

**Background:**

D2.1 P366L65:

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| The null subcarriers are located near the DC or edge tones to protect those tones near the DC or edge tones from the interference of a neighboring RU. |

**Proposed Resolution: CID 13429**

**Revised**.Propsed text update in 11-18/0057r0 clarifies that the null subcarriers near the DC tone are to protect from the transmit center frequency leakage and receiver DC offset.

Instruction to Editor: Implement the proposed text changes in 11-18/0057r0 under CID 13429.

**Proposed Text Updates: CID 13429**

*TGax Editor: Update D2.1 P366L65 as shown below.*

The null subcarriers are located near the DC or edge tones to provide protection from interferences such as transmit center frequency leakage, receiver DC offset, and interference from neighboring RUs.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 14050 | 28.3.3.4 | 365.36 | There are only three LTF types - 1x, 2x and 4x. "Except 1x and 2x" is just 4x. | Change "same, except for the 1x HE-LTF and 2x HE-LTF." to "same for the 4x HE-LTF." |

**Discussion:**

D2.1 P366L30:

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| * Pilot subcarriers   If pilot subcarriers are present in the HE-LTF field of an HE SU PPDU, HE MU PPDU, HE ER SU PPDU, or HE TB PPDU, the pilot subcarrier locations in the HE-LTF field and Data field shall be the same, except for the 1x HE-LTF and 2x HE-LTF. In a 1x HE-LTF, the pilot subcarrier locations in the HE-LTF only consist of the pilot subcarriers for the Data field that are multiples of four. If pilot subcarriers are present in a 2x HE-LTF, then their locations shall be the same as those pilots in a 4x data symbol. All pilot subcarriers are at the even indices enumerated in Table 28-10 (Pilot subcarrier indices). |

Commenter is correct that “except for the 1x HE-LTF and 2x HE-LTF” is equivalent to “for the 4x HE-LTF”.

**Proposed Resolution: CID 14050**

**Accepted**.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 12878 | 28.4.3 | 520.12 | "T\_HE\_PREAMBLE is defined as in Equation (28-114) and Equation (28-115)" -- neither of those equations defines T\_HE\_PREAMBLE | Number the T\_HE\_PREAMBLE equation and refer to this instead |

**Discussion:**

D2.1 P522:

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D2.1 P481-482:

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The commenter is correct that equations (28-114) and (28-115) do not define *THE-PREAMBLE*.

**Proposed Resolution: CID 12878**

**Revised**.Propsed text update in 11-18/0057r0 fixes the equation numbering as suggested by the commenter.

Instruction to Editor: Implement the proposed text changes in 11-18/0057r0 under CID 12878.

**Proposed Text Updates: CID 12878**

*TGax Editor: Add label to the equation at D2.1 P482L4 as shown below.*

 (28-115a)

*TGax Editor: Update D2.1 P522L12 as shown below.*

 is defined as in Equation (28-115a), and *SignalExtension* takes the value of aSignalExtension as defined in Table 19-25 (HT PHY characteristics).

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 12686 | 28.4.3 | 521.26 | "NDBPS is defined in Table 28-15 (Frequently used parameters)" -- yes, but that table says it's N\_DBPS,0, which is not defined |  |

**Discussion:**

D2.1 P523:

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D2.1 P394 Table 28-15 – Frequently used parameters:

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*NDBPS,0* is the *NDBPS,u* for the user *u*=0. And *NDBPS,u* is defined in the same row as *NDBPS*.

**Proposed Resolution: CID 12686**

**Rejected**.NDBPS,0 is the NDBPSU,u for the user u=0. And NDBPS,u is defined in the same row of Table 28-15 as NDBPS.

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| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** |
| 13612 | 28.4.3 | 521.44 | In Equation (28-133), aRX >0 condition is not exclusive to other condition, and aRX is always positive since it is only one of 1,2,3,4 | Change the condition aRX > 0 to either otherwise or aRX \neq 4 in Eq (28-133) of D2.0 |

**Discussion:**

D2.1 P523:

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The commenter is correct the condition for the second row in Equation (28-133) is erroneous. “Otherwise” would be sufficient as suggested by the commenter.

**Proposed Resolution: CID 13612**

**Revised**.Agree with the commenter that the second condition for Equation (28-133) need to be fixed.

Instruction to Editor: At D2.1 P523L45 Equation (28-133), change “aRX > 0” to “otherwise”.

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