IEEE P802.11
Wireless LANs

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| CR for CIDs related to HE ER SU PPDU |
| Date: 2018-01-10 |
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Abstract

This submission proposes resolutions for the following comments on HE ER SU PPDU of TGax D2.0:

* 12099, 12100, 13640, 11261, 11495, 11563, 11902, 12003, 12061,

12533, 12553, 12649, 12650, 12656, 13639, 13947, 13948

Revisions:

* Rev 0: Initial version of the document.

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 TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| **CID** | **Clause Number** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 12099 | 28.1.4 | 331.55 | "HE ER SU PPDU format (HE\_EXT\_SU) ... is similar to the HE SU PPDU format". Yes, that's a fair summary: it's very similar indeed; in fact so similar that it's hard to justify its presence in the draft. While it may be possible to assert some sort of justification on the grounds of providing extended support for outdoor applications, any such justiifcation should be balanced against the benefits of having a compact specification composed of a minimum number of \*standard\* modes. A compact specification eases the tasks of developing and testing products, and helps the standardization process by reducing bloat and easing the task of review. In this case, the gains of this mode seem far too marginal to justify its inclusion in the ax amendment. | Remove the HE ER SU PPDU format and all references to it in the draft. | **Revised.**There are some differences between HE ER SU PPDU and HE SU PPDU as listed below: (i) HE-SIG-A is 16 us in HE ER SU PPDU while 8 us in HE SU PPDU (ii) L-STF and L-LTF are power boosted by 3 dB in HE ER SU PPDU while no power boost in HE SU PPDU.Agree the benefit of this mode is not significant and not for all devices as illustrated in the Discussions part of doc.: IEEE 802.11-18/0150r0. Also refer to 15/1309r1, 16/0047r0 for more discussions.Propose to make support for reception of HE ER SU PPDUs optional and add a capability bit to indicate it. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12100 | 28.1.4 | 331.57 | "Support for the HE ER SU PPDU format is mandatory." No persuasive justification for this requirement has ever been provided. The benefits provided by the format appear to be very marginal, being limited to a small extension of range in certain special cases. If the mode is to be in the draft at all, it should be optional. | Change "mandatory" to "optional" in this sentence. | **Accepted.**CID 12100, 13640 have the following proposed resolution:Agree to make HE ER SU PPDU support optional. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 13640 | 28.1.1 | 328.8 | The HE ER SU feature should not be a mandatory feature. This feature will not be tested and may not be supported in all devices, so there will be interoperability issue if no capability signaling. | Add a capability bit for HE ER SU PPDU. | **Revised.**CID 12100, 13640 have the following proposed resolution:Agree to make HE ER SU PPDU support optional. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 11261 | 27.15.2 | 314.59 | Since use of ER SU PPDUs may lead to low throughputs and other undesired effects enable the receiver to be able to disable its recepiton (similar to disabling low MCSs from AP or UL MU Disable). | As in comment. Will submit a proposal. | **Revised.**Adding a capability bit for HE ER SU PPDU rx is a simpler and cleaner solution. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 11495 | 27.15.2 | 314.59 | In the text "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peerSTA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial BandwidthExtended Range field equal to 1," the Partial Bandwidth Extended Range field refers to the support ofhigher 106-tone ER SU; however, the 242-tone ER SU should be defined with respect to support of 242-tone ER SU; define a new support field in theHE Capabilities element; | Define Full Bandwidth Extended Range field in the HE Capabilities element and link tothe transmission of 242-tone HE ER SU PPDU. | **Revised.**Agree that existing signalling is not a very clean method. Instead of add a capability bit for Full BW HE ER SU PPDU, propose to use a new capability bit for supporting reception of HE ER SU PPDU. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 11563 | 27.15.2 | 314.60 | Regarding "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial Bandwidth Extended Range field equal to 1;", there is "DCM Max Constellation Rx" and "DCM Max NSS Rx", which one or both? This seems like a tricky way to make HE ER SU PPDU optional. Just add a PHY Capability bit and make it simpler and decoupled from DCM. | as in comment | **Revised.**Agree to use a new capability bit for HE ER SU PPDU reception. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 11902 | 27.15.2 | 314.59 | "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial Bandwidth Extended Range field equal to 1"-- this sentence is contradictory with 28.1.1, where Tx and Rx HE ER SU with 242-tone RU is mandatory (meaning no capability bits required). | Remove the sentence "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial BandwidthExtended Range field equal to 1" | **Revised.**CID 11902, 12061, 12553, 13947 and 13948 have the following proposed resolution:It is more reasonable to make reception of HE ER SU PPDU optional and use one capability bit to signal it. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12003 | 27.15.2 | 314.60 | The "DCM Rx field" is undefined. Probably should replace with the "DCM Max Constellation Rx" subfield in the HE PHY Capabilities Information field. | As suggested. | **Revised.**Agree name of the subfield is not correct. Instead of correct the name, propose to use a new capability bit for HE ER SU PPDU reception. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12061 | 27.15.2 | 314.59 | HE ER 242 is a mandaotry mode and shall not depend on other featrures like DCM or ER 106 | Fix the bugs | **Revised.**CID 11902, 12061, 12553, 13947 and 13948 have the following proposed resolution:It is more reasonable to make reception of HE ER SU PPDU optional and use one capability bit to signal it. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12533 | 27.15.2 | 314.59 | The mentioed capability bits have nothing to do with 242-tone ER SU | Fix the issue mentioned in comment. | **Revised.**Refer to resolution for CID 11563*TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12553 | 27.15.2 | 314.59 | The capbility bits are not related to 242 ER SU | Remove the sentence. | **Revised.**CID 11902, 12061, 12553, 13947 and 13948 have the following proposed resolution:It is more reasonable to make reception of HE ER SU PPDU optional and use one capability bit to signal it. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12649 | 27.15.2 | 314.51 | "A first STA shall not transmit a Control frame inan HE ER SU PPDU to a second STA unless the second STA indicates the reception of HE ER SU PPDU." -- there is no signalling to indicate (lack of) support for reception of HE ER PPDUs | Add an explicit HE PHY Capabilities bit to indicate support for HE ER PPDU rx | **Revised.**Refer to resolution for CID 11563*TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12650 | 27.15.2 | 314.58 | "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peerSTA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial BandwidthExtended Range field equal to 1" -- this doesn't make sense: neither DCM nor upper-half ER are mandatory for full-width ER | Add an explicit HE PHY Capabilities bit to indicate support for RU242 HE ER PPDU rx | **Revised.**Refer to resolution for CID 11563*TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 12656 | 27.15.2 | 314.60 | "DCM Rx field" -- there is no such field | Change the cited text to "DCM Max Constellation Rx subfield in the HE PHY Capabilities Information field" | **Revised.**Agree name of the subfield is not correct. Instead of correct the name, propose to use a new capability bit for HE ER SU PPDU reception. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 13639 | 27.15.2 | 314.61 | It's not natural to use a combination of two capability bits to indicate support of HE ER SU PPDU. | Add a capability bit for HE ER SU PPDU | **Revised.**Refer to resolution for CID 11563*TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 13947 | 27.15.2 | 314.59 | "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial Bandwidth Extended Range field equal to 1; otherwise the STA shall not transmit a 242-tone HE ER SU PPDU to the peer STA."Even though the peer STA does not support either the DCM Rx or the Partial Bandwidth Extended Range, the peer STA does not have any issue for receiving a 242-tone HE ER SU PPDU.See the following in 28.1.1:An HE STA shall support the following features:-- Transmission and reception of an HE ER SU PPDU that consists of a 242-tone RU spanning the entire primary 20 MHz PPDU bandwidthRemove "otherwise the STA shall not transmit a 242-tone HE ER SU PPDU to the peer STA." | Because all HE STA shall support a transmission and reception of an HE ER SU PPDU that consists of a 242-tone RU, remove "otherwise the STA shall not transmit a 242-tone HE ER SU PPDU to the peer STA." | **Revised.**CID 11902, 12061, 12553, 13947 and 13948 have the following proposed resolution:It is more reasonable to make reception of HE ER SU PPDU optional and use one capability bit to signal it. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |
| 13948 | 27.15.2 | 314.59 | "An HE STA may transmit a 242-tone HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the DCM Rx field greater than 0 or with the Partial Bandwidth Extended Range field equal to 1; otherwise the STA shall not transmit a 242-tone HE ER SU PPDU to the peer STA."Because the DCM Rx field does not exist in an HE Capabilities element. The above sentence does not make sense. Also, technically, because all HE STA shall support a transmission and reception of an HE ER SU PPDU that consists of a 242-tone RU, any constraint for a transmission and reception a 242-tone ER SU PPDU is not needed. | Remove the cited sentence. | **Revised.**CID 11902, 12061, 12553, 13947 and 13948 have the following proposed resolution:It is more reasonable to make reception of HE ER SU PPDU optional and use one capability bit to signal it. Refer to the Discussions part in doc.: IEEE 802.11-18/0150r0 for detailed explanations. *TGax Editor*: Please change the text as indicated in **doc.: IEEE 802.11-18/0150r0** |

**Discussions:**

HE ER SU PPDU is for achieving longer range. However, not all STAs need to support reception of HE ER SU PPDU to extend the range of a link. The range of a link is typically limited by UL due to unbanlanced Tx power of AP and non-AP STA. So the range extension is obtained by using HE ER SU PPDU in UL. For non-AP STAs, there is only very minor benefit to support reception of HE ER SU PPDU.

Also, desire for longer range may be applicable in limited scenarios. Throughput of HE ER SU PPDUs is very low because of the longer preamble, lower MCS, narrow BW and only up to 2 Nsts support. For STAs requiring high throughput such as video streaming devices, HE ER SU PPDUs are not useful.

Note that the trend of WiFi is trying to remove low rate modes such as 11b to avoid low efficient use of airtime/frequency resources. We should not encourage people to use very low rate mode such as HE ER SU PPDU by making it mandatory. It is against 11ax’s design philosophy and against the technology trend for WiFi standards.

As we can see, HE ER SU PPDU format is not always needed and may not be implemented in all devices. It is reasonable to make HE ER SU PPDU format support optional. Signaling for capability of HE ER SU PPDU reception is very important to avoid interoperation problems.

There could be many methods to signal the capability of HE ER SU PPDU. For example use the combination of capability bits for DCM and partial BW ER as currently specified in the spec draft. But as many commenters pointed out, these bits are not directly related to HE ER SU and it’s not a clean signalling method. Another possible method is allowing receiver to disable HE ER SU PPDU reception similar to disabling low MCSs. This method can solve the interop risk but it’s not a natural way to signal the capability. In 11ax, a tuple of <MCS, NSS> are not supported if the tuple is “*marked as unsupported in the Rx MCS bitmask of HT capabilities element of the receiver STA.*” So reception of a <MCS, NSS> tuple is actually signalled in HT capabilities field. Using one capability bit to indicate supporting of HE ER SU PPDU is the simplest and cleanest method.

TGax editor: please make the following change related to CID 12100, 13640, 11261, 11495, 11563, 11902, 12003, 12061, 12533, 12553, 12649, 12650, 12656, 13639, 13947, 13948:

**9.4.2.237.3 HE PHY Capabilities Information field**

***TGax Editor: Please edit the following text on D2.0 P139Line 28 as shown below.***

 B69 B70 B71

|  |  |  |
| --- | --- | --- |
| Midamble Rx 2x And 1x HE-LTF | HE ER SU PPDU Rx | Reserved |

 Bits: 1 1 1

***TGax Editor: Please edit the following text on D2.0 P144Ln34, P145Ln6 and P145Ln 16 as shown below.***

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| Partial Bandwidth Extended Range | Indicates support for the ~~transmission and~~ reception of ~~the Data field of the~~an HE ER SU PPDU when transmitted over the high frequency 106-tone RU within the primary 20 MHz channel. | Set to 0 if not supported. Set to 1 if supported.Set to 0 if the HE ER SU PPDU Rx subfield is set to 0. |
| …… | …… | …… |
| HE ER SU PPDU With 4x HE-LTF And 0.8 us GI | Indicates support for the reception of an HE ER SU PPDU with 4x LTF and 0.8 us guard interval duration. | Set to 0 if not supported. Set to 1 if supported.Reserved if the HE ER SU PPDU Rx subfield is set to 0.  |
| …… | …… | …… |
| HE ER SU PPDU With 1x HE-LTF And 0.8 us GI | Indicates support of the reception of an HE ER SU PPDU with 1x LTF and 0.8 us guard interval duration. | Set to 0 if not supported. Set to 1 if supported.Reserved if the HE ER SU PPDU Rx subfield is set to 0. |
| …… | …… | …… |
| HE ER SU PPDU Rx | Indicates support for the reception of an HE ER SU PPDU.  | Set to 0 if not supported. Set to 1 if supported. |

**27.15.2 PPDU format selection**

***TGax Editor: Please edit the following text for 27.15.2 on D2.0 P314Ln59 as shown below.***

An HE STA may transmit an ~~242-tone~~ HE ER SU PPDU to a peer HE STA if it has received from the peer STA an HE Capabilities element with the ~~DCM Rx~~ HE ER SU PPDU field ~~greater than 0~~ equal to 1 ~~or with the Partial Bandwidth Extended Range field equal to 1~~; otherwise the STA shall not transmit an ~~242-tone~~ HE ER SU PPDU to the peer STA.

**28.1.1 Introduction to the HE PHY**

***TGax Editor: Please edit the following text on D2.0 P328Line 8 as shown below.***

An HE STA shall support the following features:

— Transmission and reception of an HE SU PPDU that consists of a single RU spanning the entire PPDU bandwidth

~~— Transmission and reception of an HE ER SU PPDU that consists of a 242-tone RU spanning the entire primary 20 MHz PPDU bandwidth~~

***TGax Editor: Please edit the following text on D2.0 P328Line 59 as shown below.***

An HE STA may support the following features:

— Transmission and reception of an HE ER SU PPDU

— HE-MCSs 8 to 11 (transmit and receive)

**28.1.4 PPDU formats**

***TGax Editor: Please edit the following text on D2.0 P331Line 56 as shown below.***

— HE ER SU PPDU format (HE\_EXT\_SU) carries a single PSDU. It is similar to the HE SU PPDU format, except that the HE-SIG-A field is repeated. Support for the HE ER SU PPDU format is ~~mandatory~~ optional.