IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| D0.3 CRs on EHT PHY Introduction CIDs | | | | |
| Date: 2021-03-01 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Bin Tian | Qualcomm | 5775 Morehouse Dr. San Diego, CA, USA |  | btian@qti.qualcomm.com |
| Kanke Wu | Qualcomm |  |  |  |
|  |  |  |  |  |

This submission shows

* Resolution for a comment received from TGbe comment collection (TGbe Draft D0.3)
* The proposed changes are based on 11be D0.3.

The submission provides resolutions to following CIDs

1082,1268,1981,2254,2773,1270,1269,1518,1604,2668, 3160, 3161,1261, 1262, 1271, 1273, 1519, 2722, 2986, 2989, 1605, 2988, 1272, 2774, 2775, 2776, 2942

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 1082 | 36.1.1 | 154 | 61 | LPI (low power indoor) is a class of RF power level as defined by the country regulators FCC and EU. Add reference to Annex E. | change ""in 6 GHz LPI channel." to in a 6 GHz LPI channel applicable in Table xx in Annex E." Update Annex E 6 GHz tables to include a list or a frequency range of LPI channels . | Revised.  MCS14 is applied to 6GHz band and remove the mentioning of LPI channel  Instructions to TGbe editor:  Please make the following changes to P154L61:  Single spatial stream EHT-MCS 14 in 6 GHz band. |
| 1268 | 36.1.1 | 154 | 55 | "6 GHz bands" is not a typical term and the typical term is not well defined | "6 GHz band" is the typical term, but actually the spectrum includes portions of 7 GHz in some regulatory domains. Replace by "6 GHz band" and create a definition of "6 GHz band" in clause 3 (or perhaps Annex E) that does not exclude the relevant portions of 7 GHz | Rejected  6GHz band term is defined in 11be spec, and Annex E has already listed all the channels applied. |
| 1981 | 36.1.1 | 154 | 61 | 6 GHz LPI channel might not be a correct term since it depends on regulations from different countries, for example, according to FCC NPRM, the whole 1.2 GHz spectrum in 6GHz band can be utilized under the condition of low power indoor operation and that's more likely to be 6 GHz LPI operation rather than kind of subset of channel/bands. It's good to clarify it clearly. | Suggest to clarify what's intended scope for the usage of single spatial stream EHT-MCS 14 and define 6 GHz LPI by a proper term in IEEE, otherwise put TBD there at this stage of draft. | Revised.  Resolution is the same as CID1082 |
| 2254 | 36.1.1 | 154 | 61 | What is LPI in "Single spatial stream EHT-MCS 14 in 6 GHz LPI channel."? Is it Low Power Indoor? If yes, this concept is not defined and is really related to regulation. Not sure it has its place in a global standard. Delete "LPI" | As in comment | Revised.  Resolution is the same as CID1082 |
| 2773 | 36.1.1 | 154 | 61 | "LPI channel" is not defined | Clarify LPI channel or remove | Revised.  Resolution is the same as CID1082 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 1270 | 36.1.1 | 156 | 39 | "can respond to at least 4" is too low given that 11be is pushing towards 16SS, and this limitation cripples the motivation for higher SS counts | Replace "4" by "8" or higher, certainly for non-IoT devices | Rejected  While I agree with commenter on the benefit of mandating the support of 8ss in sounding, the task group motion 124, #SP182, only to mandate 4ss, is a compromise between the benefit and complexity. |
| 1269 | 36.1.1 | 156 | 31 | "total number of SSs across all users of at least 4" is too low given that 11be is pushing towards 16SS, and this limitation cripples the motivation for higher SS counts | Option A: Replace "4" by "8" or higher, certainly for non-IoT devices. Option B: Allow support for as little 4SS per RU but still require support for 8-16 EHTLTFs. | Rejected  While I agree with commenter on the benefit of mandating the support of 8ss, the task group motion 124, #SP182, only to mandate 4ss, is a compromise between the benefit and complexity. |
| 1518 | 36.1.1 | 153 | 58 | TB PPDU also supports the preamble puncturing . So. TB PPDU shold be inclded in this sentence. | as in comment. | Rejected  For MU PPDU, preamble puncturing can be loosely defined as the case of preamble not occupying the entire PPDU bandwidth. For TB PPDU, a STA always transmits preamble aligned with its assigned RU, very often the assigned RU and preamble doesn’t span the entire PPDU bandwidth. For example, a STA transmitting 20MHz preamble in an 80MHz TB PPDU. It can be simply due to AP assignment or the result of puncturing channel due to CCA. There is no difference from preamble point of view, so it is better not using the preamble puncture term on the TB PPDU. Instead, the spec has clear text on how to transmit preamble in an TBPPDU and the support of MRU. |
| 1604 | 36.1.1 | 156 | 59 | Primary 160 MHz channel needs to be defiend. | Define primary 160 MHz channel. | Revised  Instructions to TGbe editor:  Please add the following definition to clause 3.2  **primary 160 MHz channel:** In a 320 MHz basic service set (BSS), the 160 MHz  channel that contains the primary 20 MHz channel. |
| 2668 | 36.1.1 | 154 | 23 | BCC coding is not used in the following cases: Propose to add regarding MCS14 | Suggest to add that BCC coding shall not be used for MCS14 (DCM+DUP Mode). This mode is applicable only for PPDU BW >= 80 MHz | Rejected  LDPC is used for BW >=20Mhz. MCS14 is defined for >=80Mhz so it is already implied that MCS14 has to use LDPC only. No need to define the special rule for MCS14. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 3160 | 36.1.1 | 153 | 15 | "HE STA in 5 GHz is required to be compliant w/ Clause 19 and 21 (see 11ax D8.0 P495L15). So, it is sufficient to say that EHT STA in 5 GHz supports Clause 27.  Similarly, HE STA in 2.4 GHz is required to be compliant w/ Clause 19 (see 11ax D8.0 P495L25). So, it is sufficient to say that EHT STA in 2.4 GHz supports Clause 27.  Also, HE STA in 6 GHz is required to be compliant w/ Clause 17 (see 11ax D8.0 P495L28). So, it is sufficient to say that EHT STA in 6 GHz supports Clause 27." | "Change the bullet at P153L15 to ""Clause 27 if the EHT STA is operating in the 2.4 GHz or 6 GHz band, or if the EHT STA supports operating channel width greater than or equal to 80 MHz and is operating in the 5 GHz band.""  And delete the two bullets at P153L26-31." | Revised  There are different options to describe the support of previous amendents/clauses by an EHT STA. One is to list all the previous supported clauses, which style is used in 11ax draft, the other is to state the support of HE while the support of other clauses can be derived from the support of HE. Agree with commenter to use the later approach which is simpler.  Editor: please make the changes as shown in 11-21/0331r3 |
| 3161 | 36.1.1 | 153 | 21 | "20 MHz-only EHT-STA needs to support Clause 17 as well (yes, it seems we missed this in 11ax as well, so needs to be fixed in REVme).  Unlike my comment on P153L15 where the EHT STA 'supports HE', here, the 20 MHz-only EHT STA supports 20 MHz tx/rx of the previous PHYs. So, we need to list out all the clauses." | Change "Clause 19, Clause 21, and Clause 27" to "Clause 17, Clause 19, Clause 21, and Clause 27 | Revised  See discussion for CID 3160  Editor: please make the changes as shown in 11-21/0331r3 |
| 1261 | 36.1.1 | 153 | 29 | In the bullets from L15-31, clause 17 and earlier clauses are only called out for 6GHz; presumably because HT in turn makes non-HT mandatory as required, but this is unclear | Option A: For clarity, insert a Note after the bulleted list like "As defined in section XXXX, the HT PHY specifications in turn mandate certain requirements from clauses 15-18". Option B (preferred): then, can this same recursive procedure be applied to other cases to reduce the size of this list: i.e. can we get away with simply: "EHT has to support HE at 6GHz, EHT>=80 has to support HE>=80 at 5GHz, EHT=20 has to support HE=20 at at 5GHz, EHT has to support HE at 2.4GHz. As defined in section XXXX, the HE PHY specification in turn mandates certain requirements from clauses 15-21" | REVISED.  Agree in principle.  See discussion for CID 3160  Editor: please make the changes as shown in 11-21/0331r3 |
| 1262 | 36.1.1 | 153 | 33 | It is not really true to say that the EHT PHY is based on the HE PHY which is based on the clause 17 PHY since in reality EHT was based on HE was based on VHT was based on HT was based on Clause 17 (and included clauses 15-16 in 2.4GHz)". The three paragraphs at L33-49 do not seem to be normative and have no obvious purpose except to relate history (incorrectly). | For L33-49, option A: replace "[which] is based on" by "[which] incorporates"; option B: delete the 2.4 and 6 GHz paragraphs, delete the "For 5 GHz operation", and, at the end of this remaining paragraph, insert "The VHT PHY is not defined for 2.4 GHz operation. The HT and VHT PHYs are not defined for 6 GHz band operation." | Rejected  There paragraphs are intended to describe inheritance relationship among different clauses. Samilar paragraph/langage are also in 11ac and 11ax. The specific paragraph commented on is for 2.4GHz band in which the operation of VHT is not allowed, so VHT is not listed in the description. |

***To TGbe editor: Please make the following changes in D0.3 P153L9 (#CID 3160,3161,1261,1262)***

Clause 36 (Extremely high throughput (EHT) PHY specification) specifies the PHY entity for an extremely high throughput (EHT) orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 36 (Extremely high throughput (EHT) PHY specification), an EHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory requirements of Clause 27 (High Efficiency (HE) PHY specification), which specifies mandatory support requirements of Clause 17, 19 and 21.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CID | Clause | P | L | Comment | Proposed Change | Resolution |
| 1271 | 36.1.1 | 156 | 50 | L50-61 refers to "operating with 80/160 MHz channel width" This does not address the important case of STAs operating with 20 MHz channel widths, since for efficiency these STAs also need to be able to particpate in 160 or 320 MHz PPDUs | Add two new bullets, such as "Reception of a 160 MHz EHT MU PPDU, or transmission of a 160 MHz EHT TB PPDU in 5 GHz and 6 GHz bands where the assigned RU/MRU is in the primary 20 MHz channel if the non-AP EHT is operating with 20 MHz channel width." and "Reception of a 320 MHz EHT MU PPDU, or transmission of a 160 MHz EHT TB PPDU in 5 GHz and 6 GHz bands where the assigned RU/MRU is in the primary 20 MHz channel if the non-AP EHT is operating with 20 MHz channel width." [And there might be constraints on which RU/MRUs can be assigned] | Rejected  20MHz-only STA and 20MHz operation STA requires are specified in the later paragraphs, starting from P157 L56 |
| 1273 | 36.1.1 | 157 | 56 | 20MHz-only STAs introduce enormous inefficiency in BSSs using wider bandwidths | Make SST mandatory for 20MHz-only STAs operating in 5 or 6 GHz | Rejected  Current SST support on 20MHz-only STA is aligned with 11ax. |
| 1519 | 36.1.1 | 158 | 24 | EHT supports the 80/160MHz operating non-AP EHT STA. add the description for 80/160MHz operating non-AP EHT STA as in a 20MHz operating non-AP EHT STA. | as in comment. | Revised.  80MHz and 160MHz operating non-AP EHT STA are defined in 21/0292 for CID 1081.  Note to editor:  No additional change is needed. |
| 2722 | 36.1.1 | 160 | 4 | Today 11ax allows 20 MHz only STAs in 2.4/5 and 6 GHz bands. It is regressive for EHT or 11be to disallow are make this error of not including 20 MHz only STAs in 6 GHz band. It is important for devices and systems that are battery and delay sensitive. | Include "and 6 GHz" in line 4 of page 160. | Rejected.  6GHz band is more suitable for wideband application. Also, PSD limit in 6GHz band limits the range of 20MHz only STA. Battery operated STA may operate better in 2.4GHz and 5GHz band. |
| 2986 | 36.1.1 | 157 | 23 | 20 MHz-only non-AP STA can't be allocated in RU/MRUs in primary 20 MHz of 40 MHz OFDMA PPDU for 2.4 GHz? P157L23, "If 40 MHz channel width in the 2.4 GHz band is supported then all RU and MRU sizes and locations applicable to 40 MHz channel width are supported except for a 20 MHz-only non-AP EHT STA, in which case the 40 MHz channel width and all RU and MRU sizes and locations of 40 MHz channel width in the 2.4 GHz band are not applicable." And there is no description for primary 20 MHz channel within 40 MHz in the 5 GHz band. In P158L4, there is description for SST case which seems conflict with text in P157L23. | Please clarify. Also, need to make sure detail description in section 36.3.2.2 is aligned. | Revised  This statement is about optional support of 40MHz channel wdith in 2.4GHz band. The requirements on the 20MHz -only STA are covered in the later paragrahs.  Editor: please make the changes as shown in 11-21/0331r3 |
| 2989 | 36.1.1 | 157 | 4 | SST is only defined for 20 MHz-only STA? For other STAs, there is no description. Release 1 SST will be only applicable for 20 MHz-only STA? Note that in section 36.3.2.2, primary channel and exeption are TBD. | If SST is supported in release 1, please add optional capability in 80 MHz and 160 MHz operating STA as well. If SST is not supported in release 1, then please delete related text. | Rejected  It is better for the task group to make decision first on the SST support of 80MHz and 160MHz operating STA in R1 then add related spec text later |
| 1605 | 36.1.1 | 158 | 24 | A 20MHz only non-AP STA optionally supports nonprimary 20MHz operation if it supports SST. Likewise, a 20MHz operating non-AP STA needs to support nonprimary 20MHz operation if it supports SST. | Add a description regarding an optional support of a nonprimary 20MHz operation for a 20MHz operating non-AP STA which supports SST similar to 20MHz only non-AP STA. | Rejected  Current SST support requirements align with 11ax. Task group needs to reach decision first on whether to expand the SST support scope. Spec text can be updated later if needed. |

***To TGbe editor: Please make the following changes in D0.3 (#CID 2986)***

P157L23

A non-AP EHT STA may support the following:

—40 MHz channel width in the 2.4 GHz band (transmit and receive). If 40 MHz channel width in the 2.4 GHz band is supported then all RU and MRU sizes and locations applicable to 40 MHz channel width are supported.

—160 MHz channel width and RU and MRU size larger than 996 tone in the 5 GHz and 6 GHz bands (transmit and receive).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2988 | 36.1.1 | 157 | 54 | Punctured sounding operation is mandatory for beamformee. Motion 144, #SP320 Also consider mandating punctured sounding for Beamformer as well. | Move P157L54 "Punctured sounding operation." to mandatory non-AP STA cases. Move P156L15 "Punctured sounding operation." to mandatory AP cases. | Revised  Motion 144, #SP320: It is mandatory for beamformee to support all partial bandwidth feedback modes aligned with the large RU/MRU.” While one may interpret the support of partial bandwidth feedback implies the support of punctured sounding, the mandatory support only applies to the BFee which is the non-AP STA  Note to the editor: please move the bullet, “Punctured sounding operation”, at P157L54 to P157L21, i.e. from “may” support section to “shall” support section of a non-AP EHT STA and change the bullet text as “Punctured sounding in which partial bandwidth of NDP is punctured”. Also change the bullet text in P156L15 from “Punctured sounding operation” to “Punctured sounding in which partial bandwidth of NDP is punctured” |
| 1272 | 36.1.1 | 157 | 50 | "within 40 MHz, 80 MHz, and 160 MHz channel widths in the 5 GHz band." is vague. | Refer to PPDU bandwidths instead. E.g. " within 40 MHz, 80 MHz, and 160 MHz PPDU bandwidths in the 5 GHz band." Similar issue with P158L2, P158L5, P158L11, P158L20 amd P158L26 | Revised  The original sentence is to specify support RU sizes “in the primary 20 MHz channel within 40 MHz, 80 MHz, and 160 MHz channel widths in the 5 GHz band.” The word “widths” is not needed and can be replaced by “PPDU”.  Note to editor:  Please make the following changes to P157L60, P158L2, P158L5, P158L11, P158L20, P158L26  Change “within 40 MHz, 80 MHz, and 160 MHz channel width” to “within 40 MHz, 80 MHz, and 160 MHz PPDU”. |
| 2774 | 36.1.1 | 155 | 18 | "MU-MIMO reception on an RU or MRU in an EHT TB PPDU where the RU or MRU is of size larger than or equal to 242 tones". This includes cases where the RU does not cover the entire BW. In contrast, MU-MIMO in 11ax is defined as "single RU spanning the entire PPDU bandwidth". While new wording is needed to cover MRU, I don't think we should change the definition for single RU. Note also that on page 156L24, DL MU-MIMO is actually defined differently. | Add proper definition of MU-MIMO that is consistent with 11ax and also covers MRU | Revised  The complete sentence is “MU-MIMO reception on an RU or MRU in an EHT TB PPDU where the RU or MRU is of size larger than or equal to 242 tones in supported bandwidth non-OFDMA transmission”. The non-OFDMA definition conveys the information that there is single RU in the entire PPDU. Please refer to the CID 1081.  Rewrite these statements to be consistent.  Note to editor  Editor: please make the changes as shown in 11-21/0331r3 |

***To TGbe editor: Please make the following changes in D0.3 (#CID 2774)***

P155L18

—Reception of non-OFDMA EHT TB PPDU utilizating MU-MIMO (UL MU-MIMO) on a RU or MRU of size larger than or equal to 242 tones in supported bandwidth ) if the AP is capable of receiving 4 or more spatial streams

P156L24

— Reception of non-OFDMA EHT MU PPDU utilizing MU-MIMO (DL MU-MIMO) on a RU or MRU of size larger than or equal to 242 tones in supported bandwidth. The maximum number of spatial streams per user the non-AP EHT STA can receive in the DL MU-MIMO transmission shall be equal to the minimum of 4 and the maximum number of spatial streams supported for reception of EHT MU PPDU sent to that EHT STA as an SU transmission. The non-AP EHT STA shall be able to receive its intended spatial streams in a DL MU-MIMO transmission with a total number of spatial streams across all users of at least 4.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2775 | 36.1.1 | 155 | 53 | "Transmission of an OFDMA EHT MU PPDU with any preamble puncturing pattern needed to support mandatory MRU for non-OFDMA as specified in 36.3.2.3.3". I don't find that requirement in 36.3.2.3.3. Large MRU support is not mandatory at AP for OFDMA. | Remove | Rejected  Please refer to motion 137, #SP 278.  “For AP, it is mandatory to support the following:   * In OFDMA Tx and non-OFDMA Tx and Rx, any preamble puncturing pattern that needs to be supported for mandatory MRU in non-OFDMA as specified in subclause 36.3.2.3.3 in D0.1.”   Large MRU for non-OFDMA is indeed specified in P191L27 of 36.3.2.3.3. |
| 2776 | 36.1.1 | 155 |  | "Transmission and reception of a non-OFDMA EHT MU PPDU with any preamble puncturing pattern needed to support mandatory MRU for non-OFDMA as specified in 36.3.2.3.3". This is mandatory for both AP and STA (see page 191L27)) | Move to bullet list "An EHT STA shall support" | Revised  Agree to move this requirement under “an ETH STA shall support” part  Note to editor  Please move the bullet on P155L50 “Transmission and reception of a non-OFDMA EHT MU PPDU with any preamble puncturing pattern …” to “154 L55.  Remove the duplicated bullet on P157L14 |
| 2942 | 36.1.1 | 154 | 62 | MCS 14 and 15 in PHY introduction not defined in MCS table. | Add definition for MCS 14 and 15. | Revised.  Add a sentence to briefly introduce MCS14 and 15.  Editor: please make the changes as shown in 11-21/0331r3 |

***To TGbe editor: Please make the following changes in D0.3 (#CID 2942)***

The EHT PHY data subcarriers are modulated using BPSK, BPSK DCM (MCS15), QPSK, 16-QAM, 64-QAM,256-QAM, 1024-QAM, and 4096-QAM (MCS12 and 13). FEC coding (convolutional or LDPC coding) is used with coding rates of 1/2, 2/3, 3/4, and 5/6. The EHT PHY introduces EHT duplicate mode as MCS14.