IEEE P802.11
Wireless LANs

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| CC23 Proposed Resolutions for Elements |
| Date: 2016-08-13 |
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Abstract

This document proposes resolutions for CC23 comments on information elements and some frame formats that employ those elements.

**REVISION NOTES:**

R0: initial

R1: \* remove note from PPET table which said that for 242 BCC, PE value is always 0 usec, adjust resolution for CID 457 appropriately

* SAP changes in R1: 11-16-0864 resolves various SAP CIDs so that most of the SAP changes that were in this document (11-16-1266) were redundant and in some cases, in conflict with what is in 11-16-0864 – after discussion with the author of 11-16-0864, it was decided that the conflicts should all be resolved according to 11-16-0864 because the proposed draft text changes in that document are based on a more recent interpretation of the information flow between SME and MLME that came from within REVmc
* Change number of leftover reserved bits in HE MAC Cap information field from 4 to 12 – another CID uses 2 of those reserved, and others might end up using a few more, so we start with 12 (or 10) free now
* CID 2277, 393, 2839 – these CIDs were not resolved in r0, they are now resolved

R2: \* Had not completely removed the note from PPET table which said that for 242 BCC, PE value is always 0 usec – this version completes the removal that was partially done in R1

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 “Instruction to 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.***

**CID LIST:**

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| **CID** | **Commenter** | **Page.Line** | **clause** | **Comment** | **Suggested change** | **Proposed resolution** |
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| 1352 | Mark RISON | 11.05 | 9.2 | The HE Operation and HE Capabilities elements are needed in other frames, e.g. frames used to establish a TDLS link | As it says in the comment | Revise – generally agree. Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 1352, see also CID 1228, 1239, document 11-16-0864 |

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| 113 | Alfred Asterjadhi | 44.38 | 9.4.2.196 | Since the TWT element (basic) and the broadcast TWT element will have different formats (bcast TWT can contain multiple TWT parameter sets) it is better to split the subclause in two dependent classes (one when Broadcast is 0 and one when Broadcast TWT is 1) and define the fields for each of them (if the fields are the same then simply refer to the previous subclause to avoid redundancy). And remove those fields (or portions of them) that are not needed. | As in comment. | Revise – generally created separate items where needed in the various proposed changes to this subclause. Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 113 |
| 114 | Alfred Asterjadhi | 45.58 | 9.4.2.196 | References are missing for the subclauses where transmission of Trigger frames with and without random Rus need to be added in these two rows | As in comment. | Revise – generally agree. Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 114 |
| 115 | Alfred Asterjadhi | 47.05 | 9.4.2.196 | Some of the entries of this table (9-248l are empty. Either add N/A or add the missing description. Also note that the Trigger is part of the TWT Parameters as well. As such add it to the note at the end of the table. | As in comment. | Revise – generally agree. Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 115 |
| 156 | Alfred Asterjadhi | 44.45 | 9.4.2.196 | What is the setting of the Responder PM field of this element when it is sent by the AP? Please specify. | As in comment. | Revise – generally agree – see resolution to CID 1214 which provides clarification. |
| 196 | Alfred Asterjadhi | 45.07 | 9.4.2.196 | Use of FlowType with Broadcast TWT is not clear | Clarify its use. | Revise – generally agree – see resolution to CID 1214 which provides clarification. |
| 213 | Alfred Asterjadhi | 46.01 | 9.4.2.196 | Use of average is not tight language.Understand the intent, but even the beacon frame is not transmitted exactly at the intended time, there is drift.Remove average. | As in comment | Reject – You cannot force reality to conform to your personal ideals of exactitude. Heisenberg has not yet been proven to have been incorrect. |
| 682 | Hyunhee Park | 26.43 | 9.4.2.196 | The TWT operation should be different from the regular TWT operation since a STA needs to receive only the Beacon frame during TWT SP. However, the spec has no text about the indication for negotiation of the first TBTT and listen interval in the TWT element, which needs to be described. | Modify the Figure 9-577ax--Control field format by adding 1-bit TBTT and LI Negotiation subfield and add related text of the TBTT and listen interval Negotiation for broadcast TWT operatoin. | Revise - Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 682 – which do not add a new field, but instead, make it clear that the scheduled STA may include a suggested TBTT value by using the suggest TWT command. |
| 723 | Jarkko Kneckt | 27.55 | 9.4.2.196 | The TWT may be signaled to contain at least one RU for random access. The clause 25.13.2 is not using TWTs to specify when the UL MU Random access is in use. Please harmonize the both clauses to use the same mechanism. | Harmonize clause 25.13.2 and this clause to use the same power save mechanisms for the random access. | Revised – agree in principle with the proposed resolution – Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 723 |
| 724 | Jarkko Kneckt | 29.30 | 9.4.2.196 | Empty slots in table. | Fill the holes | Revised – agree in principle with the proposed resolution – Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 724 – note that empy slots are filled with NA as appropriate and similar to CID 1156, 1157, 1158, 1327 |
| 971 | kaiying Lv | 76.56 | 9.4.2.196 | There is no CQI frame.CQI report is one of the modes of sounding feedback. | Suggest to change to"Frames transmitted during a broadcast TWT SP are recommended to be limited to: PS-Poll, CQI, QoS Null with buffer status, Sounding Feedback, Management Action..." | Revised – agree in principle with the proposed resolution – Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 971 |
| 1156 | Kwok Shum Au | 29.29 | 9.4.2.196 | The entry is left empty. | Fill in the empty blanket with "N/A". | Accept |
| 1157 | Kwok Shum Au | 29.42 | 9.4.2.196 | The entry is left empty. | Fill in the empty blanket with "N/A". | Accept |
| 1158 | Kwok Shum Au | 30.24 | 9.4.2.196 | The entry is left empty. | Fill in the empty blanket with "N/A". | Accept |
| 1205 | Liwen Chu | 27.50 | 9.4.2.196 | Sounding Feedback should be right after NDPA, NDP. | Removing sounding feedback. | Revised – generally agree with commenter specifically that the language is ambiguous; propose to include a reference to sounding feedback subclause. Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 1205 |
| 1206 | Liwen Chu | 29.13 | 9.4.2.196 | Scheduled TWT is broadcasted by AP, no negotiation is required. | As in comment. | Reject while the scheduling STA makes the decisions about when to send Broadcast TWT, it can make the best decisions if it has input from the STAs that it wishes to serve – the cited entry provides a path for that input. |
| 1319 | Mark RISON | 26.53 | 9.4.2.196 | "The Broadcast field indicates if the TWT SP [...] is a broadcast TWT [...]. The Broadcast field is set to 1 to indicate that the TWT(s) defined by the TWT element are broadcast TWT(s)" -- so is it singular (only one TWT SP is indicated) or plural (more than one TWT SP can be indicated)? | Make it all-singular or all-plural | Accept - Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 1319 |
| 1320 | Mark RISON | 27.49 | 9.4.2.196 | Presumably TFs are also in the recommended list | Add TFs to the recommended list | Revise - Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 1320 – these changes explicitly declare that there are no restrictions for the scheduling STA. |
| 1321 | Mark RISON | 27.56 | 9.4.2.196 | Presumably TFs are also in the recommended list | Add TFs to the recommended list | Accept - Tgax editor shall make the changes shown in 11-16-1266r2 under all headings that include CID 1321 |
| 1322 | Mark RISON | 27.51 | 9.4.2.196 | "Trigger frames transmitted by the AP during the broadcast TWT SP do not contain RUs for random access." -- this is not a recommendation but a promise, no? | Make it clear that the stuff about the TFs' RUness is not part of the "recommendations on the types of frames that are transmitted during the broadcast TWT SP" but something normative that the STAs can rely on | Revised – Agree in principle with the comment – note that the normative text is located elsewhere, since it cannot appear in this subclause. TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1322. |
| 1323 | Mark RISON | 27.58 | 9.4.2.196 | "Trigger frames transmitted by the AP during the broadcast TWT SP contain at least one RU for random access." -- this is not a recommendation but a promise, no? | Make it clear that the stuff about the TFs' RUness is not part of the "recommendations on the types of frames that are transmitted during the broadcast TWT SP" but something normative that the STAs can rely on | Revised – Agree in principle with the comment – note that the normative text is located elsewhere, since it cannot appear in this subclause. TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1323 |
| 1324 | Mark RISON | 28.05 | 9.4.2.196 | It says "beacon frames" | Change to "Beacon frames" | Accept |
| 1325 | Mark RISON | 28.05 | 9.4.2.196 | "beacon frames containing broadcast TWT," -- what does this mean? How does a beacon contain a broadcast TWT? | Reword in terms of "with a TWT element that indicates a broadcast TWT" or similar | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1324 |
| 1327 | Mark RISON | 29.04 | 9.4.2.196 | There are 3 blank cells in this table | Put "N/A" in each | Revised – Agree in principle with the comment – note that one entry is now filled with text that is not N/A – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1327 |
| 1655 | Matthew Fischer | 26.38 | 9.4.2.196 | The table of TWT command values is not clear. | Clarify the relationships among the various command options and provide more explanation as to how each one is to be used. | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1655 |
| 1721 | Osama Aboulmagd | 26.38 | 9.4.2.196 | It is not clear to me why 11ax should TWT with no added value. The TWT will attract 100 of comments and waste lots of energy answering these comments. | Delete TWT from the amendment and all related sections. | The comment fails to identify a technical issue. Please refer to the contributions that have discussed this topic in IEEE for the added value: TargetWakeTime: <https://mentor.ieee.org/802.11/dcn/12/11-12-0823-00-00ah-targetwaketime.pptx>Scheduled Trigger frames:<https://mentor.ieee.org/802.11/dcn/15/11-15-0880-02-00ax-scheduled-trigger-frames.pptx> |
| 2276 | Xiaofei Wang | 26.43 | 9.4.2.196 | The definition of Boradcast field is unnecessary because if TWT element is contained in a beacon frame, it is broadcast without ambiguity | remove L43~L56 | Revise – use of the Broadcast bit is extended to allow a broadcast TWT response to a request for an individual TWT agreement and to allow an explicit request for a broadcast TWT agreement as well as identifying the specific role of the transmitter of a TWT IE. TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2276 |
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| 2278 | Xiaofei Wang | 28.21 | 9.4.2.196 | The sentence is confusing and not clear whether the wake time in the TWT response frame is the TBTT of the broadcast TWT, or the actual start time of the TWT SP | Specify the wake time in the TWT response frame with the trigger field set to 1, is the TBTT for the broadcast TWT element | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2278 which explicitly mentions “wake for the corresponding TWT SP” |
| 2390 | Yongho Kim | 28.01 | 9.4.2.196 | The words TWT requesting/responding STA and TWT scheduled/scheduling STA is mixed in some subclause, whether they are distinguished in other subclauses. Clarification is needed. | distinguish the TWT requesting/responding STA and TWT scheduled/scheduling STAchange the paragraph as below:In a TWT element transmitted by a TWT requesting STA 'or TWT scheduled STA', the TWT wake interval is equal to the average time that the TWT requesting STA 'or TWT scheduled STA' expects to elapse between successive TWT SPs. In a TWT element transmitted by a TWT responding STA 'or TWT scheduling STA', the TWT wake interval is equal to the average time that the TWT responding STA expects to elapse between successive TWT SPs. | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2390 |
| 2391 | Yongho Kim | 30.42 | 9.4.2.196 | TWT protection field needs to be explained for HE PPDU as agreed in SFD(see 16/0359r2). | Insert the followings:"Change the text as shown in subclause9.4.2.196 TWT element:An S1G TWT requesting STA sets the TWT Protection subfield to 1 to request the S1G TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT flow identifier by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that(those) TWTs. An S1G TWT requesting STA sets the TWT Protection subfield to 0 if TWT protection by RAW allocation is not requested for the corresponding TWT(s). An HE TWT Requesting STA sets the TWT Protection subfield to 1 to request the S1G TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT flow identifier by NAV protection defined in 10.3.2.4 (Setting and resetting the NAV ), 10.3.2.8 (Dual CTS protection), or 10.3.2.8a (MU RTS/CTS procedure).When transmitted by a TWT responding STA that is an AP, the TWT Protection subfield indicates whether the TWT SP(s) identified in the TWT element will be protected. An S1G TWT responding STA sets the TWT Protection subfield to 1 to indicate that the TWT SP(s) corresponding to the TWT flow identifier(s) of the TWT element will be protected by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that(those) TWT(s). An S1G TWT responding STA sets the TWT Protection subfield to 0 to indicate that the TWT SP(s) identified in the TWT element might not be protected from TIM STAs by allocating RAW(s)." | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2391 |
| 2830 | Yusuke Tanaka | 27.29 | 9.4.2.196 | should this be a recommendation? | remove "recommends on" | Reject – yes it should be a recommendation. |
| 2831 | Yusuke Tanaka | 27.48 | 9.4.2.196 | should this be a recommendation? | remove "recommended to be" | Reject – yes it should be a recommendation. |
| 2832 | Yusuke Tanaka | 27.55 | 9.4.2.196 | should this be a recommendation? | remove "recommended to be" | Reject – yes it should be a recommendation. |

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| 116 | Alfred Asterjadhi | 48.58 | 9.4.2.213 | There are many features (PHY and MAC) which capabilities entry is missing in this HE Capabilities Informaiton field. Add the missing capabilities to the HE Capabilities information field. | As in comment. | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 116 |
| 200 | Alfred Asterjadhi | 49.57 | 9.4.2.213 | Per 25.10.3, Multiple TIDs Capable is a capability that needs to be negotiated. Also the STA is supposed to indicate the maximum number of TIDs it supports (there is a motion on this). Hence this values should be the one added in the HE Caps. | Add the Max Nr of TIDs field to HE Capabilities Element. | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 200 |
| 201 | Alfred Asterjadhi | 49.57 | 9.4.2.213 | Add "HE Link Adaptation" subfield (Table 9-18a) in the HE Capabilities element to enable this mode. | Add support for HE Link Adaptation field in HE Capabilities Element | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 201 |
| 263 | Bin Tian | 32.19 | 9.4.2.213 | It is mentioned that the RU count sub-field has reserved values for 0 and 3. However, the table has defined those values. | Remove the sentences that indicate that 0 and 3 for the RU count is reserved | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 263 |
| 264 | Bin Tian | 33.05 | 9.4.2.213 | Table 9-ax14 is inconsistent and redundant. The titles to the columns are unnecessarily complicated and the second to last row is redundant. It is also not clear how the fields PPET8 and PPET16 can be absent when the bits are allocated to them according to the RU count and Nss | Simplify the titles in the columns in the table. Clearly state the packet extension value when PPET8 and PPET16 are both NONE. This should be done in one place and not two. The PE values in the last two rows should have units added.Clarify the option when the fields PPET8 and PPET16 can be absent. This may require redefinign the number of bits allocated to the fields. | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 264 – commenter to note that the headings do not change because while complicated, they are accurate and no simplification is suggested, nor is any simplification obvious. The second to last row is not redundant as there is a difference between none and not present and none is needed unless the encoding of the PPET8, PPET16 fields is to be changed to become more complex (e.g. a bitmap would have to be included for each NSS and RU combination in the thresholds field) |
| 387 | Brian Hart | 31.16 | 9.4.2.213 | PPE | Expand this acronym / put it in section 3 | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 387 |
| 388 | Brian Hart | 31.24 | 9.4.2.213 | "the STA is an HE STA" | Sending of an HE Cap element is the usual indication of being an HE STA ... delete phrase. Ditto P31L30 | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 388 |
| 389 | Brian Hart | 31.52 | 9.4.2.213 | "up to one fragment per MSDU" ... clarify ... is the same as "not fragmented at all"? | Add NOTE, or "i.e. ..." | Reject – the text is clear, the reader needs to read the entire phrase – “one fragment for each MSDU … within a single A-MPDU” |
| 390 | Brian Hart | 33.40 | 9.4.2.213 | Index assignment is back-to-front | 0 for 242,1 for 484 etc | Reject – yes, the observation is correct. The BRC assumes that the commenter intended to state that for some reason the assignment order should be reversed. The rationale for the given ordering is that the higher allocations are more likely to require thresholds while the lower allocations are not likely to require them and therefore, when a count of less than 4 is specified, the likely unneeded lower RU size allocation fields do not need to appear and this reduces the total overhead. But for an additional two bits, a bit mask could be used instead if desired. Using a bit mask would save 10 bits for an 80 MHz only device, and 22 bits for a 20 MHz only device. So the RU Count field is replaced by an RU Maks field. TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 390 |
| 391 | Brian Hart | 33.40 | 9.4.2.213 | Field and table is unreferenced | RU Allocation Index is defined here but never used anywhere else. Use it or lose | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 391 |
| 392 | Brian Hart | 34.36 | 9.4.2.213 | "shall also declare .. Class A/B" | Where / how are these classes declared? Add | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 392 |
| 457 | Daewon Lee | 32.01 | 9.4.2.213 | Combined minimum total duration of the post-FEC padding and packet extension requirement for an HE PPDU for 242 tone RU can be either for BCC encoded PPDU or LDPC encoded PPDU. However, the required total duration for different encoder types are different. The specification is not clear whether the same required duration capability applies for both BCC and LDPC or the required duration capability only applies for LDPC. | Clarify that combined minimum total duration of the post-FEC padding and packet extension requirement for an HE PPDU is intended for LDPC encoded PPDUs. BCC encoded PDDUs do not have such requirement for STAs. | Reject – After discussion, PHY experts agree that the commenter is incorrect |
| 571 | EVGENY KHOROV | 32.32 | 9.4.2.213 | It is not defined the exact NNS value for every PPET16 PPET8 field | Replace "for NNSx" with "for NSS=x" | Reject – the value NSS=1 is by definition present if the field is present. The value n represents the highest NSS value. The definition of the field does not allow for skipping of some NSS values. It is questionable whether the bit savings for this once-per association frame is enough justification to change the format to use a bitmask for the NSS values. |
| 572 | EVGENY KHOROV | 32.19 | 9.4.2.213 | If the RU Count subfield has the reserved values of 0 and 3, why is it 2 bit long but not 1 bit long? | Explain in the standard or change the size to 1 bit | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 572 – note that additional allocations are defnied and the changes use a bit mask instead of a count field. |
| 573 | EVGENY KHOROV | 32.46 | 9.4.2.213 | the text is not clear: "for each value of NSS and RU specified by the field and implicitly, for values of NSS and RU not explicitly indicated in the field." | Change as follows: explicitly for each value of NSS and RU specified by the field, and implicitly for values of NSS and RU not indicated in the field. | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 573 |
| 666 | Huizhao Wang | 34.08 | 9.4.2.213 | No place in HE Capability Element defined for class A or class B | In HE Capabilities Information field, need to define a bit to indicate the STA is class A | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 666 |
| 667 | Huizhao Wang | 30.46 | 9.4.2.213 | Lack of DL/UL OFDMA, and UL MU-MIMO Capabilities in HE Capabilities element (a technical contribution will be followed later) | Need to add DL/UL OFDMA and UL MU-MIMO capabilities into HE Capabilities element so that HE AP and STA can accurately signaling each other of DL/UL OFDMA and UL MU-MIMO capabilities | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 667 |
| 1027 | KE YAO | 32.00 | 9.4.2.213 | The relationship between RU count subfield and the following RU allocation index is not clear. does RU count "2" means there are 2 RU units and the first RU unit is 2x996 and the second RU unit is 996? If so, why are 484 and 242 not present? At least 3 should be reasonable. | 1. describe the relationship between RU count subfield and RU allocation index2. make the meaning of RU count clear, suggest to define an RU count Minus 1 like NSS M1, then the real count number can be 1~43. remove the text about "3 is reserved "4. if the second suggestion is accepted, then text about "0 is reserved" should also be deleted | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1027 |
| 1159 | Kwok Shum Au | 31.16 | 9.4.2.213 | There is no "HE PPE Thresholds field". | Change "HE PPE Thresholds field" to "PPE Thresholds field" in lines 16 and 17. | Revised – Agree in principle with the comment – TGax editor to refer to CID 1330 which makes the same change |
| 1160 | Kwok Shum Au | 31.52 | 9.4.2.213 | In Table 9-ax13, what is the difference between "within a single A-MPDU" and "within an A-MPDU"? | Change "within a single A-MDPU" to "within an A-MPDU". | Accept |
| 1161 | Kwok Shum Au | 32.37 | 9.4.2.213 | There is no "PPE Thresholds Info field". | Change "PPE Thresholds Info field" to "PPE Threshold Info field". | Revised – Agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1161 |
| 1162 | Kwok Shum Au | 32.46 | 9.4.2.213 | It is unclear from the sentence "and implicitly, for values of NSS and RU not explicitly indicated in the field" why we need to state both "implicitly" and "not explicitly". | Delete "implicity". | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1161 |
| 1163 | Kwok Shum Au | 33.34 | 9.4.2.213 | Does Table 9-ax15 belong to subclause 9.4.2.213 and particularly the RU Count subfield of the PPE Threshold field? There is no description or reference for this table in this subcaluse. | Please provide text to link the RU Count subfield with Table 9-ax15 or move Table 9-ax15 to an appropriate subclause. | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1163 |
| 1164 | Kwok Shum Au | 34.04 | 9.4.2.213 | Does Table 9-ax16 belong to subclause 9.4.2.213 and particularly the PPET8 and PPET16 encoding in Table 9-ax14? There is no linkage between these two tables and there is no description for Table 9-ax16 in this subclause. | Please provide text to link the two tables together or move Table 9-ax16 to an appropriate subclause. | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1164 |
| 1183 | Lei Huang | 33.25 | 9.4.2.213 | The second last row in table 9-ax14 is redundant since the case of "PPET8 ==NONE" and "PPET16 ==NONE" has been covered by the case of "X < PPET8 or PPET8 == NONE" and "X < PPET16 or PPET16 == NONE" as shown in the second row in the same table. | Delete the second last row of Table 9-ax14. | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1183 |
| 1207 | Liwen Chu | 30.46 | 9.4.2.213 | TWT is complicated. The feature should be diveded to Implicit TWT and broadcast TWT. For Implicit TWT, two options should be announced: wakeup at the beginning of TWT without polling, polling before transmitting frames to STAss. | As in comment. | Revised – see CID 1214 - Agree in principle with the comment. Please note that this is already the case in what has been defined so far: HE TWT operation is divided into Implicit TWT (see 10.44.3 (Implicit TWT), which as mentioned has one without polling (unannounced), and one with polling (announced. Similar considerations apply to broadcast TWT (see 10.44.4 (Broadcast TWT). Explicit TWT is not allowed as the value of the Implicit bit shall be set to 1 (see P48L61). The proposed resolution makes this clearer by stating these conditions at the beginning of the subclauses.  TGax editor to make the changes shown in 11-16/zzzzrm under all headings that include CID 1214 |
| 1332 | Mark RISON | 32.20 | 9.4.2.213 | "HE PPE threshold information" -- what is this? | Add some words to explain | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1332 |
| 1333 | Mark RISON | 31.18 | 9.4.2.213 | "because no packet extension is ever required for the STA transmitting this field" -- no justification is needed | Delete the cited text | Revised – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1333 |
| 1335 | Mark RISON | 31.52 | 9.4.2.213 | "within a single A-MPDU" -- this is implicit in the other two cases | Change "within a single A-MPDU" to "within an A-MPDU" | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1335 |
| 1343 | Mark RISON | 34.34 | 9.4.2.213 | "STA that declare support for HE trigger-based PPDU shall also declare whether they belong to class A or class B." -- this class thing needs some kind of xref, as it has not appeared so far | Xref to 26.3.12.4.6 | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1343 |
| 1344 | Mark RISON | 34.34 | 9.4.2.213 | "STA that declare support for HE trigger-based PPDU shall also declare whether they belong to class A or class B." -- OK, but how? | Add a bit to declare one's class | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1344 |
| 1346 | Mark RISON | 30.45 | 9.4.2.213 | Don't we need some other stuff like the operational HE-MCS set? | Add missing stuff, based on what's in the (V)HT Capabilities elements | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1346 |
| 1348 | Mark RISON | 32.19 | 9.4.2.213 | If 0 and 3 are reserved you don't need a 2-bit field | Make it a one-bit field, with 0 meaning 1 RU and 1 meaning 2 RUs | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1348 |
| 1415 | Mark RISON | 32.01 | 9.4.2.213 | The PPE stuff is not clear | Describe more clearly how PPET8 for NSSn for RUm maps to Table 9-ax14--PPET8 and PPET16 encoding. Perhaps add an informative annex giving some examples | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1415 |
| 1452 | Mark RISON | 32.19 | 9.4.2.213 | Not clear what RU Count is. It's a 2-bit value with 0 and 3 reserved. Does it map to 'm' in Figure 9-ax4? | Please clarify text | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1452 |
| 1453 | Mark RISON | 33.30 | 9.4.2.213 | What is the 'RU Allocation Index' in Table 9-ax15? How/where is it used? | Please define its usage | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1453 |
| 1679 | Oghenekome Oteri | 32.19 | 9.4.2.213 | There are only 2 values (1 or 2) not reserved for RU count per NSS but there are 4 RU allocation indices in table 9-ax15 | clarify how this field signals different BW per Nss | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1679 |
| 1680 | Oghenekome Oteri | 34.01 | 9.4.2.213 | When QPSK DCM is used, it is not clear what is the modulation order (QPSK or BPSK) to be compared with the constellation index of PE threshold. The decoding time may be different for QPSK with DCM and without DCM for the same {Nss, BW} and may not necessarily need to have the same PE | clarify the PE threshold rules for DCM | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1680 – commenter to note that in the lookup table, the value of m (RU allocation index) used to perform the lookup of the threshold values for DCM now corresponds to the RU allocation size that is one less than the actual allocation size used for the DCM PPDU – this change is inside of table 9-ax16 PPET8 and PPET16 encoding |
| 1723 | Osama Aboulmagd | 30.58 | 9.4.2.213 | What is PPE? And its threshold? | define PPE | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1723 |
| 1724 | Osama Aboulmagd | 33.37 | 9.4.2.213 | Table 9-ax15: RU Allocation Under encoding doesn't seem to be part of ant of the Figures shown in this clause. Something is missing but it is hard to find out what is missing. | Clarify | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1724 |
| 1725 | Osama Aboulmagd | 34.05 | 9.4.2.213 | Table 9-ax 16: Same as the previous comment. Where is this field, "Constellation Index encoding"? | Clarify | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1725 |
| 1797 | Robert Stacey | 31.34 | 9.4.2.213 | It is not clear whether fragmentation level support applies to the originator or recipient. Presumably the level of support at the recipient since the originator is in control of what it transmits. However, 25.3.2 reads as if the capability is at the orig | Change "that is supported by a STA" to "that is supported by the STA as a recipient". Modify 25.3.2 so that behavior at the originator is dependent on recipient capability and not originator capability. | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1797 – see also resolutions to CID 1472, 1473 |
| 1798 | Robert Stacey | 31.45 | 9.4.2.213 | It is not clear whether fragmentation support "3" implies support for "2". And whether support "2" implies support for "1". | Clarify. Its not clear to me that level 3 support is better than level 2 support. It is just a different way of supporting fragmentation. | Revise – agree in principle with the comment – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1798 |
| 1799 | Robert Stacey | 31.34 | 9.4.2.213 | What is "HE fragmentation"? This term is not defined. Also, fragmentation is supported in all STAs. Why would we have no fragmetnation support for HE STAs? Support for fragmentation using VHT single MPDU is supported by all VHT STAs. Why would we remove support in HE STAs? | Change "HE fragmentation" to "fragmentation. Remove "No support for HE fragmentation" capability. Remove the "support for in VHT single MPDU" capability. All VHT STAs already support this and so should HE STAs. | Revise – agree with much of the comment, but there is actually a difference, which is the constancy of the fragment size, so these are all different – a name change is warranted – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1799 |
| 1803 | Robert Stacey | 31.22 | 9.4.2.213 | TWT might be useful for IoT use cases. IoT applications may not directly benefit from many of the HE features, especially in cost reduced applications. Make TWT available to pre-HE devices. | Move TWT capabilities to the Extended Capabilities element so the TWT is not coupled with HE functionality. | Revise – agree in principle with the comment, copy not move – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1803 |
| 1883 | Sigurd Schelstraete | 31.01 | 9.4.2.213 | Wrong reference | Figure 9-554ab should be Figure 9-ax2 | Revise – see CID 617 |
| 1884 | Sigurd Schelstraete | 32.06 | 9.4.2.213 | What is the meaning of "M1"? | Replace "M1" with "Count" | Reject – M1 alone is not a term so it does not have a meaning, although the implied meaning is “minus 1” – the proposed change to count would create confusion, because the resulting field name would be NSS count, but in fact, the value in the field would not be the NSS count, but one less than the value of the NSS count, hence the current name of “NSS M1” |
| 1885 | Sigurd Schelstraete | 32.19 | 9.4.2.213 | Change "RU allocation values" to "RU sizes" | "RU allocation" is used differently in other context | Revise – format changed entirely to a bitmask, so the problem is resolved in a different manner - TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1885 |
| 1886 | Sigurd Schelstraete | 32.20 | 9.4.2.213 | Are two values enough for the field "RU Count"? | Clarify | Revise – there are now four values – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1886 |
| 1887 | Sigurd Schelstraete | 32.30 | 9.4.2.213 | Which values of NSS1 and Rum are to be included in the PPE Thresholds Info Field? | Clarify | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1887 |
| 1888 | Sigurd Schelstraete | 32.39 | 9.4.2.213 | Whats is the format of "Constellation Index Value"? Add reference to Table 9-ax16 if appropriate. | See also line 41 | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1888 |
| 1889 | Sigurd Schelstraete | 32.45 | 9.4.2.213 | Elsewhere "minimum duration of the post-FEC padding and packet extension for HE PPDUs" is refered to as "maximum PE duration" (see e.g. page 152) | Replace "minimum duration of the post-FEC padding and packet extension for HE PPDUs" with "maximum PE duration" | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1889 |
| 1890 | Sigurd Schelstraete | 32.45 | 9.4.2.213 | "combined to encode" should be "combined to determine" | See comment | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1890 |
| 1891 | Sigurd Schelstraete | 32.46 | 9.4.2.213 | "implicitly, for values of NSS and RU not explicitly indicated in the field.".If there is an implicit assumption about how missing values are to be interpreted, this should be clarified. | See comment | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1891 |
| 1892 | Sigurd Schelstraete | 33.10 | 9.4.2.213 | Replace "minimum duration of the post-FEC padding and packet extension for HE PPDUs" with "maximum PE duration" | See comment | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1892 |
| 1893 | Sigurd Schelstraete | 33.31 | 9.4.2.213 | "RU allocation" should be "RU size" | See also line 37 | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1893 |
| 1894 | Sigurd Schelstraete | 33.34 | 9.4.2.213 | Where are the "RU allocation Index" values used or indicated? | Clarify | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1894 |
| 1896 | Sigurd Schelstraete | 34.35 | 9.4.2.213 | The paragraph starting at line 35 appears out of place | Move paragraph or make clear what it's relevance is here. | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1895 |
| 2307 | Yasuhiko Inoue | 30.56 | 9.4.2.213 | PPE should be described in the clause 3.4 | As in the comment | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2307 |
| 2836 | Yusuke Tanaka | 32.39 | 9.4.2.213 | More description necessary | as commented. | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2836 |
| 2837 | Yusuke Tanaka | 32.41 | 9.4.2.213 | More description necessary | as commented. | Accept – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2837 |
| 2838 | Yusuke Tanaka | 34.35 | 9.4.2.213 | Is description of Class A vs. Class B necessary? | remove description of Class A and B, | Revise – a bit is added to the HE Cap IE and the paragraph is modified and moved - TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2838 |
| 2392 | Yongho Kim | 31.05 | 9.4.2.213 | The support of being TWT scheduling STA and TWT scheduled STA needs to be declared in HE Capabilities | Use Reserved bit in HE Capabilities field format(Table 9-554b) to indicate the support of TWT scheduling STA and TWT scheduled STA:Change bit B5 to TWT scheduling STA supportChange bit B6 to TWT scheduled STA supportInsert the followings:"The TWT scheduling STA Support field indicates support by an HE STA for the role of TWT scheduling STA as described in 10.44.4 (Broadcast TWT operation).The TWT scheduled STA Support field indicates support by an HE STA for the role of TWT scheduled STA as described in 10.44.4 (Broadcast TWT operation)." | Revise – a bit is added to the HE Cap IE for Broadcast TWT which serves both purposes, depending on STA functionality (i.e. AP or non-AP) - TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2392 |
| 2393 | Yongho Kim | 31.05 | 9.4.2.213 | The support of HE triggered-based PPDU needs to be declared in HE Capabilities | Use Reserved bit in HE Capabilities field format(Table 9-554b) to indicate the support HE trigger-based PPDU:Change bit B7 to HE trigger-based PPDU Capable | Reject – the group has determined that this function is mandatory for HE STA and therefore, no bit is needed. |
| 2394 | Yongho Kim | 31.05 | 9.4.2.213 | The support of +HTC-HE needs to be declared in HE Capabilities | Use Reserved bit in HE Capabilities field format(Table 9-554b) to indicate the support of +HTC-HE:Change bit B8 to +HTC-HE CapableInsert the followings:"+HTC-HE Capable bit indicates whether the STA supports receiving a HE variant HT Control field." | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2394 |
| 2466 | Yongho Seok | 31.49 | 9.4.2.213 | "Support for fragments that are contained within a VHT single MPDU, no support for fragments within an A-MPDU"A VHT single MPDU is also a subset of an A-MPDU. Change the corresponding sentence as the following:"Support for a fragment that is contained within an S-MPDU only"Because a terminology of a VHT single MPDU has been changed from 802.11ah draft.Also change "[a] VHT Single MPDU" to "[an] S-MPDU" throughout the 802.11ax draft. | As per comment | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2466 |

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| 117 | Alfred Asterjadhi | 53.07 | 9.4.2.214 | Some information is missing here. E.g., is Basic MCS and NSS Set going to be inherited from VHT or will it be different from VHT? If the second is the case then need to add it and its definition. Also BSS Color is 6 bits so replace TBD with 6 bits. And the AP can enable certain features (e.g., RTS transmisstions from its STAs). This needs a bit to activate it or not. Check if anyother feature needs dynamic signaling of its activation or not. | As in comment | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 117 |
| 202 | Alfred Asterjadhi | 53.10 | 9.4.2.214 | Change TBD for BSS Color bitmap size to 6 bits | As in comment | Revise – see CID 244 |
| 267 | Bin Tian | 34.35 | 9.4.2.214 | It is stated that STAs should also declare themselves to be Class A or B devices. However no additional description on the capabilities is provided | Describe the capabilities of Class A and class B devices explicitly or reference the locatiuon where the classes are defined. | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 267 |
|  |  |  |  |  |  |  |
| 620 | Geonjung Ko | 35.10 | 9.4.2.214 | BSS Color field size for HE-SIG-A was decided. | Modify BSS Color bit size in Figure 9-ax6 to 6. | Revise – see CID 244 |
| 621 | Geonjung Ko | 35.15 | 9.4.2.214 | When transmitting a frame before the transmitting non-AP STA receives HE Operation element (e.g. sending a Probe Request frame), BSS Color setting in HE Operation element is not clear. According to this part, a value of 0 does not mean the BSS Color and zero value for BSS Color field can be used in this case. | To use zero value for BSS Color field as in comment, we need a modification of a sentence after "except that" as below,"except that a value of 0 in this field indicates that there is no BSS Color for this BSS or that HE Operation element has not been received from the recipient AP." | Reject – the commenter is referring to the value of a color field within a phy header and the meaning of the value 0 in that context, and is not referring to the value within the HE Op IE – so no change needed here in the operation IE clause |
| 1347 | Mark RISON | 34.38 | 9.4.2.214 | Don't we need some other stuff like the basic HE-MCS set? | Add missing stuff, based on what's in the (V)HT Capabilities elements | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1347 |
| 1764 | Po-Kai Huang | 26.13 | 9.4.2.214 | The number of bits of BSS color is 6 as defined in HE-SIG-A. | Use 6 bits for BSS Color in HE Operation element | Revise – see CID 244 |
| 2308 | Yasuhiko Inoue | 35.10 | 9.4.2.214 | It is agreed that BSS Color is 6 bits in length. | TBD under BSS Color field shall be 6.TBD under Reserved field shall be 10. | Revise – see CID 244 |
| 2377 | Yonggang Fang | 26.12 | 9.4.2.214 | The BSS Color is included in HE-SIG-A. Please clarify why it needs to define HE Operation element of BSS Color? |  | Reject – members of each BSS need to know the color used within that BSS and the HE Op IE is the element that describes parameters that are particular to each BSS |
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| 198 | Alfred Asterjadhi | 23.44 | 9.3.3.5 | Remove HE Operation from Association Request | Remove HE Operation from Association Request | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 198 |
| 2253 | Weimin Xing | 23.44 | 9.3.3.5 | the "HE Operation element" should not be in Association request frame, Reassociation request frame or Probe Request frame. | delete the HE Operation row in table 9-29 P23, table 9-31 P24, table 9-33 P24 | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2253 |
| 2425 | Yongho Seok | 23.44 | 9.3.3.5 | Because the HE Operation element is provided by the HE AP, the HE Operation element is not needed in the Association Request frame.Delete the HE Operation element from Table 9-29. | As per comment | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2425 |

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| 1152 | Kwok Shum Au | 24.16 | 9.3.3.6 | In subclause 6.3.11.2.2, HE Operation element is present when both BSSType = INFRASTRUCTURE and dot11HEOptionImplemented is true". | Change "The HE Operation element is present when the dot11HEOptionImplemented is true" with "The HE Operation element is present when both BSSType = INFRASTRUCTURE and dot11HEOptionImplemented is true". | Revise – feels like the commenter has it reversed – the infrastructure condition is already present and does not need to be present - TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1152 |
| 197 | Alfred Asterjadhi | 42.37 | 9.3.3.7 | Remove HE Operation from Reassociation Request | Remove HE Operation from Reassociation Request | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 197 |
| 2426 | Yongho Seok | 24.37 | 9.3.3.7 | Because the HE Operation element is provided by the HE AP, the HE Operation element is not needed in the Reassociation Request frame.Delete the HE Operation element from Table 9-31. | As per comment | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2426 |

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| 199 | Alfred Asterjadhi | 43.45 | 9.3.3.9 | Remove HE Operation from Probe Request | Remove HE Operation from Probe Request | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 198 |
| 1314 | Mark RISON | 25.17 | 9.3.3.9 | HE Operation makes no sense in a probe request | Delete this row | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 1314 |
| 2427 | Yongho Seok | 25.17 | 9.3.3.9 | Because the HE Operation element is provided by the HE AP, the HE Operation element is not needed in the Probe Request frame.Delete the HE Operation element from Table 9-33. | As per comment | Revise – TGax editor to make the changes shown in 11-16/1266r2 under all headings that include CID 2427 |

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| --- | --- | --- | --- | --- | --- | --- |
| 2277 | Xiaofei Wang | 27.16 | 9.4.2.196 | It is unclear what the value should be set for the TWT command setup field for the TWT element sent in the beacon | Suggest to add description for the quoted case and use 6 for TWT command setup field | Revise – see 11-16-1189r1 which makes appropriate draft text changes to resolve the comment |
| 393 | Brian Hart | 35.16 | 9.4.2.214 | 0 = no color but no clause 25 language that describes how "no color" is used | Add | Revise – other CIDs also addressed this issue which was resolved with the following language found in 25.11 of D0.4: An HE STA transmitting an HE SU PPDU or an HE extended range SU PPDU for which one or more intended recipient STAs is not a member of a transmitting STA's BSS shall set the TXVECTOR parameter BSS\_COLOR of the HE PPDU to 0. An HE STA that received an HE SU PPDU or an HE extended range SU PPDU with RXVECTOR parameter BSS\_COLOR equal to 0 shall not discard the HE PPDU. |
| 2839 | Yusuke Tanaka | 35.14 | 9.4.2.214 | How should the BSS Color be set for Public action frames for Inter-BSS and AP to unassociated-STA communications? | Define one BSS colors for Inter-BSS and AP to unassociated-STA communications | Revise – see 11-16-1223r6 which makes appropriate changes |

**Discussion:**

xxxx

**Proposed changes**

As shown below.

**CID 1352**

**6.3.27.4 MLME-DLS.indication**

**6.3.27.4.2 Semantics of the service primitive**

**TGax editor: *Add the following item to the parameter list:***

 HE Capabilities,

**TGax editor: *Add the following item to the parameter description table:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| HE Capabilities | As defined in frame format | As defined in 9.4.2.213 (HE Capabilities element) | Specifies the parameters within the HE Capabilities element that are supported by the MAC entity. The parameter is optionally present if dot11HEOptionImplemented is true; otherwise not present. |

**TGax editor: *add the editing instructions and the table entries as shown:***

**9.6.4.2 DLS Request frame format**

***Insert the following new rows (header row shown for convenience) into Table 9-299 (DLS Request frame Action field format):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, |
| TBD | HE Operation | The HE Operation element is present when dot11HEOptionImplemented is true; otherwise it is not present, |

**9.6.4.3 DLS Response frame format**

***Insert the following new row (header row shown for convenience) into Table 9-300 (DLS Response frame Action field format):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, |

**9.6.8.16 TDLS Discovery Response frame format**

***Insert the following new row (header row shown for convenience) into Table 9-317 (TDLS Discovery Response Action field format):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, The HE Capabilities element is defined in 9.4.2.213 (HE Capabilities element) |

**9.6.13.2 TDLS Setup Request Action field format**

***Insert the following new row (header row shown for convenience) into Table 9-343 (Information for TDLS Setup Request Action field):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, The HE Capabilities element is defined in 9.4.2.213 (HE Capabilities element) |

**9.6.13.3 TDLS Setup Response Action field format**

***Insert the following new row (header row shown for convenience) into Table 9-344 (Information for TDLS Setup Response Action field):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true and the Status Code is SUCCESS; otherwise it is not present, The HE Capabilities element is defined in 9.4.2.213 (HE Capabilities element) |

**9.6.13.4 TDLS Setup Confirm Action field format**

***Insert the following new row (header row shown for convenience) into Table 9-345 (Information for TDLS Setup Confirm Action field):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Operation | The HE Operation element is present when dot11HEOptionImplemented is true, the TDLS Setup Response frame contained an HE Capabilities element and the Status Code is SUCCESS; otherwise it is not present, The HE Operation element is defined in 9.4.2.214 (HE Operation element) |

**9.6.16.2.2 Mesh Peering Open frame details**

***Insert the following new row (header row shown for convenience) into Table 9-365 (Mesh Peering Open frame Action field format):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, |
| TBD | HE Operation | The HE Operation element is present when dot11HEOptionImplemented is true; otherwise it is not present, |

**9.6.16.3.2 Mesh Peering Confirm frame details**

***Insert the following new row (header row shown for convenience) into Table 9-366 (Mesh Peering Confirm frame Action field format):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| TBD | HE Capabilities | The HE Capabilities element is present when dot11HEOptionImplemented is true; otherwise it is not present, |
| TBD | HE Operation | The HE Operation element is present when dot11HEOptionImplemented is true; otherwise it is not present, |

**11.23 Tunneled direct-link setup**

**11.23.1 General**

The VHT Operation element shall be present in a TDLS Setup Confirm frame when both STAs are VHT capable and the TDLS direct link is not established in the 2.4 GHz band. When the TDLS Setup Confirm frame includes a VHT Operation element, the Basic VHT-MCS And NSS Set field is reserved.

The HE Operation element shall be present in a TDLS Setup Confirm frame when both STAs are HE capable.

**11.24.6.4 Measurement exchange**

For the Fine Timing Measurement frames transmitted during the FTM session:

— The responding STA shall not use a bandwidth wider than that indicated by the STA in the initial Fine Timing Measurement frame.

— The responding STA shall not use an HE format if the STA indicated VHT or HT-mixed or non-HT format in the initial Fine Timing Measurement frame.

— The responding STA shall not use a VHT format if the STA indicated HT-mixed or non-HT format in the initial Fine Timing Measurement frame.

— The responding STA shall not use an HT format if the STA indicated non-HT format in the initial Fine Timing Measurement frame.

**CID 682, 1319, 113, 2276, 1655, 976**

**TGax Editor: *Change the text as shown:***

9.4.2.196 TWT element

***TGax Editor: Change the figure below as follows (note that change to the number of octets for the Target Wake Time field):***

 Repeat for each TWT parameter set when Broadcast = 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | Element ID | Length | Control | RequestType | TargetWake Time | TWT Group Assignment | Nominal Minimum TWTWake Duration | TWT Wake Interval Mantissa | TWT Channel | NDP Paging(optional) |
| Octets:  | 1 | 1 | 1 | 2 | 8, 2, or 0 | 9 or 3 or 0 | 1 | 2 | 0 or 1 | 0 or 4 |
| * TWT element format.
 |

**TGax Editor: *Insert a “Wake TBTT Negotiation” bit in Figure 9-586ax (Control field format)***

**TGax Editor: *Change the text as shown:***

Insert the following paragraph after Table 9-248l (TWT Setup Command field values):

The Broadcast field indicates if the TWT SP(s) indicated by the TWT element are for broadcast or individual TWT(s) as defined in 10.45 (Target Wake Time TWT) . The Broadcast field is set to 1 to indicate that the TWT SP(s) defined by the TWT element are associated with broadcast TWT(s); otherwise, it is set to 0. When the Broadcast field is 1 then one or more TWT parameter sets are contained in the TWT element where the TWT parameter set is the set of subfields that occur after the Control subfield; otherwise only one TWT parameter set is contained in the TWT element. S1G STAs always set the Broadcast bit to 0.

TheWake TBTT Negotiation subfield indicates that the scheduled STA transmitting the TWT element is indicating a value for the next wake TBTT for a broadcast TWT in the Target Wake Time field and is indicating a value for a wake interval between Beacon frames in the TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields as described in 25.7.3.3 (Negotiation of wake TBTT and listen interval). TheWake TBTT Negotiation subfield is set to 0 in TWT elements transmitted by a responding STA and by a scheduling STA.

***Change Figure 9-577ay (Request Type field format) as follows (B4 from "Reserved" to "Trigger").***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B3 | B4 | B5 | B6 | B7 B9 | B10   B14 | B15 |
|  | TWT Request | TWT SetupCommand | ~~Reserved~~Trigger | Implicit | Flow Type | TWT Flow Identifier | TWT Wake Interval Exponent | TWT Protection |
| Bits:  | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| Figure 9-577ay -- Request Type field format |

Insert the following paragraph after Table 9-248l (TWT Setup Command field values):

The Trigger field indicates if the TWT SP indicated by the TWT element includes Trigger frames as defined in 10.44 (Target wake time (TWT)). The Trigger field is set to 1 to indicate that at least one Trigger frame is transmitted during the TWT SP. The Trigger field is set to 0 otherwise.

Change the following paragraph:

When transmitted by a TWT requesting STA, the TWT Channel field contains a bitmap indicating which channel the STA requests to use as a temporary primary channel during a TWT SP. When transmitted by a TWT responding STA, the TWT Channel field contains a bitmap indicating which channel the TWT requesting STA is allowed to use as a temporary channel during the TWT SP. Each bit in the bitmap corresponds to one minimum width channel for the band in which the TWT responding STA’s associated BSS is currently operating, with the least significant bit corresponding to the lowest numbered channel of the operating channels of the BSS.The minimum width channel is equal to the SST Channel Unit field of the SST Operation element if such an element has been previously received or is equal to 1 MHz for a BSS with a BSS primary channel width of 1 MHz and 2 MHz for a BSS with a BSS primary channel width of 2 MHz if no such element has been previously received from the AP to which the SST STA is associated. A value of 1 in a bit position in the bitmap transmitted by a TWT requesting STA means that operation with that channel as the primary channel is requested during a TWT SP. A value of 1 in a bit position in the bitmap transmitted by a TWT responding STA means that operation with that channel as the primary channel is allowed during the TWT SP. The TWT Channel field is not present when the TWT Broadcast field has the value 1.

**CID 1320, 1321**

**TGax Editor: *Change the text as shown:***

Change the text as shown in subclause 9.4.2.196 TWT element:

The TWT Flow Identifier subfield contains a 3-bit value which identifies the specific information for this TWT request uniquely from other requests made between the same TWT requesting STA and TWT responding STA pair. For a TWT SP that is indicated in a TWT response transmission that is a broadcast TWT SP, the TWT Flow Identifier subfield contains a value that indicates recommendations on the types of frames that are transmitted by scheduled STAs during the broadcast TWT SP, encoded according to Table 9-248l1 (TWT Flow Identifier field for a broadcast TWT element).

**CID 114, 1320, 1321, 1322, 1323, 2830, 2831, 2832, 971, 1205**

**TGax Editor: *Change the table below this subclause as follows:***

***Insert a new table as follows:***

Table 9‑248l1 - TWT Flow Identifier field for a broadcast TWT element

|  |  |
| --- | --- |
| **TWT Flow Identifier field value** | **Description when transmitted in a broadcast TWT element** |
| 0 | No constraints on the frames transmitted during a broadcast TWT SP. |
| 1 | Frames transmitted during a broadcast TWT SP by a TWT scheduled STA are recommended to be limited to:* Frames with reduced payload sizes that deliver control feedback:
* PS-Poll, QoS Null frames
* Feedback can be contained is the QoS Control field or in the HE variant HT Control field of the frame, whichever is present (see 25.5.1 (DL MU operation), 25.5.2 (UL MU operation), 25.8 (Receive operating mode), 25.14 (Link adaptation using the HE variant HT Control field), etc.)
* Frames that are sent as part of a sounding feedback exchange (see 25.6 (HE sounding protocol)
* Management frames
* Action, or Action No Ack frames

There are no restrictions on the frames transmitted by the scheduling STA of the broadcast TWT SP.Trigger frames transmitted by the AP during the broadcast TWT SP will not contain RUs for random access (see 10.44.4.2 (Rules for TWT scheduling STA). |
| 2 | Frames transmitted during a broadcast TWT SP by a TWT scheduled STA are recommended to be limited to:* Frames with reduced payload sizes that deliver control feedback
* PS-Poll, QoS Null frames
* Feedback can be contained is the QoS Control field or in the HE variant HT Control field of the frame, whichever is present (see 25.5.1 (DL MU operation), 25.5.2 (UL MU operation), 25.8 (Receive operating mode, 25.14 (Link adaptation using the HE variant HT Control field), etc.)
* Frames that are sent as part of a sounding feedback exchange (see 25.6 (HE sounding protocol)
* Management frames
* Action Ack, Action No Ack, or (Re-)Association Request frames

There are no restrictions on the frames transmitted by the scheduling STA of the broadcast TWT SP.Trigger frames transmitted by the AP during the broadcast TWT SP will contain at least one RU for random access (see 10.44.4.2 (Rules for TWT scheduling STA). |
| 3-7 | Reserved |

**CID 1324, 1325, 113, 2278, 2390, 144**

**TGax Editor: *Change the paragraph below as follows:***

In a TWT element transmitted by a TWT requesting or scheduled STA, the TWT wake interval is equal to the average time that the TWT requesting STA expects to elapse between successive TWT SPs. In a TWT element transmitted by a TWT responding or scheduling STA, the TWT wake interval is equal to the average time that the TWT-responding STA expects to elapse between successive TWT SPs. In a TWT element contained in a TWT request that is sent by the scheduled STA to negotiate the wake intervals for Beacon frames that contain a TWT element that indicates a broadcast TWT, the TWT wake interval indicates the value of the listen interval (see 10.44.3.4 (Negotiation of TBTT and listen interval).

The TWT Wake Interval Exponent subfield is set to the value of the exponent of the TWT wake interval value in microseconds, base 2. The TWT wake interval of the requesting STA is equal to (TWT Wake Interval Mantissa) × 2^(TWT Wake Interval Exponent).

Change the paragraph below as follows:

When transmitted by a TWT requesting STA or a TWT scheduled STA, the Target Wake Time field contains a positive integer which corresponds to a TSF time at which the STA requests to wake, or a value of zero when the TWT Setup Command subfield contains the value corresponding to the command “Request TWT”. The Target Wake Time field is 8 octets when the Broadcast field is 0; otherwise it is 2 octets with the lowest bit of the 2 octets corresponding to bit 4 of the relevant TSF value. When a TWT responding STA or a TWT scheduling STA with dot11TWTGroupingSupport equal to 0 transmits a TWT element to the TWT requesting STA, the TWT element contains a value in the Target Wake Time field which corresponds to a TSF time at which the TWT responding STA requests the TWT requesting STA or TWT scheduled STA to wake for the corresponding TWT SP and it does not contain the TWT Group Assignment field.

**CID 682, 724, 1156, 1157, 1158, 1327, 115, 113**

**TGax Editor: *Change the table as follows:***

Table 9‑257l – TWT Setup Command field values

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TWT Setup Command field value** | **Command name** | **Description when transmitted by a TWT requesting STA,** Wake TBTT Negotiation subfield **subfield = 0** | **Description when transmitted by a TWT responding STA,** Wake TBTT Negotiation subfield **subfield = 0** | **Description when transmitted by a TWT scheduled STA,** Wake TBTT Negotiation subfield **subfield = 1** | **Description when transmitted by a TWT scheduling STA,** Wake TBTT Negotiation subfield **subfield = 1** |
| 0 | Request TWT | The Target Wake Time field of the TWT element contains 0s as the TWT responding STA specifies the target wake time value for this case, other TWT parameters\* are suggested by the TWT requesting STA in the TWT request. | N/A | N/A | N/A |
| 1 | Suggest TWT | TWT requesting STA includes a set of TWT parameters such that if the requested target wake time value and/or other TWT parameters cannot be accommodate, then the TWT setup might still be accepted. | N/A | The Target Wake Time field of the TWT element contains 0s as the TWT scheduling STA specifies the target wake time value for this case, other TWT parameters are suggested by the TWT scheduled STA in the TWT request. | N/A |
| 2 | Demand TWT | TWT requesting STA includes a set of TWT parameters such that if the requested target wake time value and/or other TWT parameters cannot be accommodate, then the TWT setup will be rejected. | N/A | The Target Wake Time field of the TWT element contains 0s as the TWT scheduling STA specifies the target wake time value for this case, other TWT parameters are demanded by the TWT scheduled STA in the TWT request. | N/A |
| 3 | TWT Grouping |  | N/A | N/A | N/A |
| 4 | Accept TWT | N/A | TWT responding STA accepts the TWT request with the TWT parameters\* indicated in the TWT element transmitted by the responding STA. | N/A | TWT scheduling STA accepts the TWT request with the TWT parameters\* indicated in the TWT element transmtted by the TWT scheduled STA.  |
| 5 | Alternate TWT | N/A | TWT responding STA suggests TWT parameters that are different from TWT requesting STA suggested or demanded TWT parameters | N/A | N/A |
| 6 | Dictate TWT | N/A | TWT responding STA demands TWT parameters that are different from TWT requesting STA TWT suggested or demanded parameters | N/A | N/A |
| 7 | Reject TWT | N/A | TWT responding STA rejects TWT setup | N/A | TWT scheduling STA rejects TWT setup |
| NOTE 1-- TWT Parameters are: TWT, Nominal Minimum Wake Duration, TWT Wake Interval and TWT Channel subfield values indicated in the element. The Trigger subfield value indicated in the element is also a TWT parameter for an HE STA. |

**CID 1655, 2276**

**TGax Editor: *Add a new paragraph and table as follows after the ninth paragraph of subclause 10.45.1 TWT Overview:***

The result of an exchange of TWT Setup frames is defined in Table 10-19b TWT Setup exchange Command interpretation. In general, the meaning of Request TWT is that the transmitting STA will negotiate the TWT parameters for a TWT agreement, Suggest TWT indicates that the transmitting STA offers a set of preferred TWT parameters for a TWT agreement but will accept whatever the responding STA indicates and Demand TWT indicates tha the transmitting STA will accept only the indicated TWT parameters for a TWT agreeement. For a responding STA, accept TWT indicates that the responding STA has initiated a TWT agreement with the given parameters, altnerate TWT indicates a counter-offer of TWT parameters without the creation of a TWT agreement and dictate TWT indicates that no TWT agreement is created, but one can be created using the indicated TWT parameters.

Table 10‑19b – TWT Setup exchange Command interpretation

|  |  |  |
| --- | --- | --- |
| **Initiating frame** | **Response frame** |  |
| **TWT Setup Command field value within a TWT Setup frame transmitted from first STA to second STA** | **TWT Setup Command field value within a TWT Setup frame transmitted from second STA to first STA** | **TWT condition after the completion of the exchange** |
| Request TWT or Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = don’t care | No frame transmitted | No new active individual TWT agreement exists with the TWT Flow ID corresponding to the Flow ID in the initiating frame. No new active Broadcast individual TWT agreement exists. |
| Request TWT or Demand TWT with Wake TBTT Negotiation subfield = 0 | Accept TWT with Broadcast subfield = 0 | An individual TWT agreement is now active and is using the TWT parameters identified in the initiating frame. The TWT parameters in the response frame match the TWT parameters of the initiating frame. |
| Suggest TWT with Wake TBTT Negotiation subfield = 0 | Accept TWT with Broadcast subfield = 0 | An individual TWT agreement is now active and is using the TWT parameters identified in the responding frame. |
| Request TWT or Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 0 | Accept TWT with Broadcast subfield = 1 | This response is not allowed. |
| Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 0 | Alternate TWT or Dictate TWT with Broadcast subfield = 0 | This response is not allowed. |
| Request TWT with Wake TBTT Negotiation subfield = 0 | Alternate TWT with Broadcast subfield = 0 | No active individual TWT agreement exists with the associated TWT Flow ID. The responder is offering an alternative set of parameters vs. those indicated in the initiating frame, as a means of negotiating TWT parameters with the requester. The requesting STA can send a new request with any set of TWT parameters and the responder might entertain the creation of an individual TWT agreement using those parameters. |
| Request TWT with Wake TBTT Negotiation subfield = 0 | Dictate TWT with Broadcast subfield = 0 | No active individual TWT agreement exists with the associated TWT Flow ID. The responder offers an alternative set of parameters vs. those indicated in the TWT request. By selecting “Dictate TWT”, the responder indicates that it is not willing to accept any other TWT parameters for the requesting STA at this time. The requesting STA can send a new request, but will only receive an Accept TWT if it uses the dictated TWT parameters. |
| Request TWT with Wake TBTT Negotiation subfield = 0 | Dictate TWT with Broadcast subfield = 1 | No active individual TWT agreement exists with the associated TWT Flow ID. A broadcast TWT agreement is now active and is using the TWT parameters identified in the responding frame. The broadcast TWT agreement is not necessarily a newly created TWT agreement. The responding STA will not create any new individual TWT agreement with the requester at this time. |
| Request TWT or Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 0 | Reject TWT with Broadcast subfield = 0 | No active individual TWT agreement exists with the associated TWT Flow ID. The responding STA will not create any new individual TWT agreement with the requester at this time. |
| Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 1 | Accept TWT or Alternate TWT or Dictate TWT or Reject TWT with Broadcast subfield = 0 | This response is not allowed. |
| Demand TWT with Wake TBTT Negotiation subfield = 1 | Accept TWT with Broadcast subfield = 1 | An active broadcast TWT agreement exists or has been created with the TWT parameters indicated in the initiating frame. |
| Suggest TWT with Wake TBTT Negotiation subfield = 1 | Accept TWT with Broadcast subfield = 1 | An active broadcast TWT agreement exists or has been created with the TWT parameters indicated in the responding frame. |
| Request TWT with Wake TBTT Negotiation subfield = 1 | Alternate TWT with Broadcast subfield = 1 | No active broadcast TWT agreement has been created with the TWT parameters indicated in the initiating frame. The responder is offering an alternative set of parameters vs. those indicated in the initiating frame, as a means of negotiating TWT parameters with the requester. The requesting STA can send a new request with any set of TWT parameters and the responder might entertain the creation of a new broadcast TWT agreement using those parameters. |
| Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 1 | Alternate TWT with Broadcast subfield = 1 | This response is not allowed. |
| Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 1 | Dictate TWT with Broadcast subfield = 1 | An active broadcast TWT agreement is either created or already exists and is using the TWT parameters identified in the responding frame. The responding STA will not create any new broadcast TWT agreement with the requester at this time |
| Suggest TWT or Demand TWT with Wake TBTT Negotiation subfield = 1 | Reject TWT with Broadcast subfield = 1 | No new active broadcast TWT agreement is created and the responding STA will not create any new broadcast TWT agreement at this time. |
| Accept TWT or Alternate TWT or Dictate TWT or Reject TWT with Wake TBTT Negotiation subfield = 0 | No frame transmitted | This exchange is not allowed. |
| Accept TWT with Wake TBTT Negotiation subfield = 1 | No frame transmitted | A broadcast TWT agreement exists and is using the TWT parameters identified in the initiating frame.  |
| Alternate TWT or Dictate TWT with Wake TBTT Negotiation subfield = 1 | No frame transmitted | The TWT parameters of the existing broadcast TWT agreement identified by the TWT Flow ID and the TA of the initiating frame have been updated to the values of the TWT parameters of the initiating frame. |
| Reject TWT with Wake TBTT Negotiation subfield = 1 | No frame transmitted | The broadcast TWT agreement identified by the TWT Flow ID and the TA of the initiating frame frame is terminated. |
| Reject TWT with Wake TBTT Negotiation subfield = 0 | No frame transmitted | The individual TWT agreement identified by the TA, RA pair of the transmitted frame and with the corresponding TWT Flow ID is terminated. |
| Note 1 - Initiating frames are all required to have Broadcast subfield value of 0.Note 2 – Request frame settings not listed in the table are not allowed. |

**CID 2391, 2390**

**TGax Editor: *Change the paragraph below as follows:***

A TWT requesting STA sets the TWT Protection subfield to 1 to request the TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT flow identifier by:

* Allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that (those) TWTs that are set up within an S1G BSS
* Enabling NAV protection during the TWT SP(s) for that (those) TWTs that are set up within an HE BSS

A TWT requesting STA sets the TWT Protection subfield to 0 if TWT protection is not requested for the corresponding TWT(s).

A TWT scheduled STA sets the TWT Protection subfield to 0.

When transmitted by a TWT responding STA or TWT scheduling STA that is an AP, the TWT Protection subfield indicates whether the TWT SP(s) identified in the TWT element will be protected. A TWT responding STA or TWT scheduling STA sets the TWT Protection subfield to 1 to indicate that the TWT SP(s) corresponding to the TWT flow identifier(s) of the TWT element will be protected by:

* Allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that (those) TWT(s) when the responding STA or scheduling STA is an S1G STA.
* Enabling NAV protection during the TWT(s) for that (those) TWTs when the responding STA or scheduling STA is not an S1G STA

A TWT responding STA or TWT scheduling STA sets the TWT Protection subfield to 0 to indicate that the TWT SP(s) identified in the TWT element might not be protected.

**CID 723, 1325**

25.13.2 Power save with UL OFDMA-based random access

**TGax Editor: *Change the second paragraph of this subclause as follows:***

An HE AP may indicate values of one or multiple Trigger frame start time(s) for random access in the broadcast TWT element that is included in the Beacon as described in 25.7.3.2 (Rules for TWT scheduling STA). The power save operation with the indication of one value of Trigger frame start time in a Beacon for random access is shown in Figure 25-4 (Illustration of Trigger frame (TF) Start Time in Beacon frame for power save operation with random access operation).

**TGax Editor: *Change the text as shown:***

An HE STA that receives a Beacon containing a TWT element that has a value of 1 in the Broadcast subfield a value of 2 in the TWT Flow Identifier subfield may enter the doze state until the start of that TWT SP as described in 10.44.4.3 (Rules for TWT scheduled STA).

**CID 1322, 1323**

**10.44.4.2 Rules for TWT scheduling STA**

**TGax Editor: *Change the item below this paragraph as follows:***

* The TWT scheduling STA shall set the TWT Flow Identifier field according to Table 8.248n1 (TWT Flow Identifier field for a broadcast TWT element). The TWT scheduling STA should only send frames that satisfy the TWT flow identifier recommendations listed in Table 8.248n1 (TWT Flow Identifier field for a broadcast TWT element) during the TWT SP(s). A Trigger frame transmitted during a broadcast TWT SP whose TWT parameter set has the TWT Flow Identifier subfield equal to 0 may contain zero or more random RU (see 25.5.2.6 (UL OFDMA-based random access). A Trigger frame transmitted during a broadcast TWT SP whose TWT parameter set has the TWT Flow Identifier subfield equal to 1 shall contain no random RU (see 25.5.2.6 (UL OFDMA-based random access). A Trigger frame transmitted during a broadcast TWT SP whose TWT parameter set has the TWT Flow Identifier subfield equal to 2 shall contain at least one random RU (see 25.5.2.6 (UL OFDMA-based random access).

**CID 200, 263, 264, 1649, 141, 26, 387, 388, 390, 391, 392, 572, 573, 666, 667, 1027, 1161, 1162, 1163, 1164, 1183, 1332, 1335, 1344, 1348, 1415, 1452, 1453, 1679, 1680, 1723, 1724, 1725, 1797, 1798, 1799, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 2307, 2836, 2837, 2838, 2392, 2394, 2466, 117, 267, 620, 201, 1346**

3. Definitions, acronyms, and abbreviations

3.4 Abbreviations and acronyms

**TGax Editor: *Add the following in the appropriate location within subclause 3.4 Abbreviations and acronyms:***

PPE PHY Padding Extension(#1723)

**TGax Editor: *Add rows to Table 9-135 – Extended Capabilities field, section heading and appropriate editing instruction as shown:***

**9.4.2.27 Extended Capabilities element (#1803)**

Change the table below by inserting the following rows (ignoring the header row):

**Table 9-135—Extended Capabilities field**

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| <ANA> | TWT Requester Support | A STA sets the TWT Requester Support field to 1 when dot11TWTOptionActivated is true, and sets it to 0 otherwise. See 11.11.9.9 (TWT section) |
| <ANA> | TWT Responder Support | A STA sets the TWT Responder Support field to 1 when dot11TWTOptionActivated is true, and sets it to 0 otherwise. See 11.11.9.9 (TWT section) |
|  |  |  |

**TGax Editor: *Make the changes shown to subclause 9.4.2.213 HE Capabilities element:***

**9.4.2.213 HE Capabilities element**

An HE STA declares that it is an HE STA by transmitting the HE Capabilities element.

The HE Capabilities element contains a number of fields that are used to advertise the HE capabilities of an HE STA. The HE Capabilities element is defined in Figure 9-ax1 (HE Capabilities element format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | HE MAC Capabilities Information | HE PHY Capabilities Information | Tx Rx HE MCS NSS Support | PPE Thresholds (optional) |
| Octets: | 1 | 1 | 5 | 9 | 2 or more | variable |

**Figure 9-ax1—HE Capabilities element format**

The Element ID and Length fields are defined in 9.4.2.1 (General).

The HE MAC Capabilities, HE PHY Capabilities Information, Tx Rx HE MCS NSS Support, and PPE Thresholds fields are defined in the subclauses below.

**9.4.2.213.1 HE MAC Capabilities Information field**

The format of the HE MAC Capabilities Information field is defined in Figure 9-ax2 (HE MAC Capabilities Information field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | B1 | B2 | B3 B4 | B5 B7 | B8 B9 | B10 B11 |
|  | +HTC HE Support | TWT Requester Support | TWT Responder Support |  Fragmentation Support | Maximum Number of Fragmented MSDUs |  Minimum Fragment Size | Trigger Frame MAC Padding Duration |
| Bits: | 1 | 1 | 1 | 2 | 3 | 2 | 2 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B12 B14 | B15 B16 | B17 | B18 | B19 | B20 | B21 |
|  | Multi-TID Aggregation Support | HE Link Adaptation | All Ack Support | UL MU Response Scheduling Support | A-BSR Support | Broadcast TWT Support | 32 bit BA Bitmap Support |
| Bits: | 3 | 2 | 1 | 1 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B22 | B23 | B24 | B25 | B26 | B28 B39 |
|  | MU Cascading Supported | Ack-Enabled Multi-TID Aggregation Support | Group-Addressed Multi-STA BlockAck in DL MU Support | OMI A-Control Support | OFDMA RA Support | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 2 | 12 |

**Figure 9-ax2—HE MAC Capabilities Information field format**

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

***TGax Editor: Delete the paragraphs that define the subfields of the HE Capabiltiies element (all of them should be located in the respective tables).***

The subfields of the HE MAC Capabilities Information field are defined in Table 9-xxx (Subfields of the HE

MAC Capabilities Information field).

***TGax Editor: Insert the table below:***

**Table 9-xxx—Subfields of the HE MAC Capabilities Information field**

|  |  |  |
| --- | --- | --- |
| Subfield | Definition | Encoding |
| +HTC-HE Support | Indicates if the STA supports the reception of an HE variant HT Control field carried in a QoS Data, QoS Null, or Management frame. | Set to 1 if the STA supports reception of an HE variant HT Control field.Set to 0 otherwise. |
| TWT Requester Support | Indicates support by an HE STA for the role of TWT requesting STA as described in 10.44 (Target wake time (TWT)). | Set to 1 if dot11TWTOptionActivated is true and the STA supports TWT requester STA functionality (see 10.44 (Target wake time (TWT))). Set to 0 otherwise. |
| TWT Responder Support | Indicates support by an HE STA for the role of TWT responder STA as described in 10.44 (Target wake time (TWT)). | Set to 1 if dot11TWTOptionActivated is true and the STA supports TWT responder STA functionality (see 10.44 (Target wake time (TWT))). Set to 0 otherwise. |
| Fragmentation Support | Indicates the level of dynamic fragmentation that is supported by a STA as a recipient. | Set to 0 for no support for dynamic fragmentation.Set to 1 for support for dynamic fragments that are contained within a VHT single MPDU, no support for dynamic fragments within an A-MPDU that is not a VHT Single MPDU.Set to 2 for support for dynamic fragments that are contained within a VHT Single MPDU and support for up to one dynamic fragment for each MSDU and each MMPDU within an AMPDU or multi-TID A-MPDU that is not a VHT Single MPDU.Set to 3 for support for dynamic fragments that are contained within a VHT Single MPDU and support for multiple dynamic fragments for each MSDU within an A-MPDU or multi-TID AMPDU and up to one dynamic fragment for each MMPDU in a multi-TID A-MPDU that is not a VHT Single MPDU. |
| Maximum Number of Fragmented MSDUs | Indicates the maximum number of fragmented MSDUs that can be concurrently received by a STA. | The maximum number of fragmented MSDUs, *Nmax*, defined by this field is *Nmax* = 2Maximum Number Of F-MPDUs, except for a value of the Maximum Number of Fragmented MSDUs equal to 7 which indicates that there is no restriction. |
| Minimum Fragment Size | Indicates the minimum payload size in Octets, for the first fragment of an MSDU that is supported by a STA. | Set to 0 for no restriction in the minimum payload size.Set to 1 for 128 Octets restriction in the minimum payload size. Set to 2 for 256 Octets restriction in the minimum payload size.Set to 3 for 512 Octets restriction in the minimum payload size. |
| Trigger Frame MAC Padding Duration | Indicates the additional amount of time defined as *MinTrigProcTime*, in microseconds, needed for a non-AP STA to process a received Trigger frame. | Set to 0 to indicate no additional processing time.Set to 1 to indicate 8 us of processing time.Set to 2 to indicate 16 us of processing time.Remaining values are reserved. |
| Multi-TID Aggregation Support | Indicates the number of TIDs minus 1 of QoS Data frames that an HE STA can aggregate in a multi-TID A-MPDU as described in 25.10.4 (A-MPDU with multiple TIDs). | Set to the number of TIDs minus 1 of QoS Data frames that an HE STA can aggregate in a multi-TID A-MPDU. |
| HE Link Adaptation Capable | Indicates whether the STA supports link adaptation using the HE variant HT Control field. | If +HTC-HE Support is 1:Set to 0 (No Feedback) if the STA does not provide HE MFB.Set to 2 (Unsolicited) if the STA provides only unsolicited HE MFB.Set to 3 (Both) if the STA can provide HE MFB in response to HE MRQ and if the STA provides unsolicited HE MFB.The value 1 is reserved.Reserved if +HTC-HE Support is 0. |
| All ACK Support | Indicates whether the STA supports reception of a Multi-STA Block-Ack frame under the all ack context (See 25.4.2) | Set to 1 is the STA supports reception of a Multi-STA BlockACk frame under the all ack context.Set to 0 otherwise. |
| UL MU Response Scheduling Support | Indicates support for receiving an MPDU that contains an UL MU Response Scheduling A-Control field. | If +HTC-HE Support is 1:Set to 1 if the STA supports reception of the UL MU Response Scheduling A-Control field.Set to 0 otherwise.Reserved if +HTC-HE Support is 0. |
| A-BSR Support | Indicates support by an AP for receiving an (A-)MPDU that contains a BSR in the A-Control subfield and support by a non-AP STA for generating an (A-)MPDU that contains a BSR in the A-Control subfield. | If +HTC-HE Support is 1:Set to 1 if the STA supports the BSR A-Control field functionality.Set to 0 otherwise.Reserved if +HTC-HE Support is 0. |
| Broadcast TWT Supported | Indicates support by an HE non-AP STA for the role of TWT scheduled STA and by an AP for the role of TWT scheduling STA as described in 25.7.3 (Broadcast TWT operation).  | Set to 1 when the STA supports broadcast TWT functionality.Set to 0 otherwise. |
| 32bit BA Bitmap Support | Indicates whether the STA supports reception of a Multi-STA BlockAck frame that has a 32 bit BlockAck Bitmap intended to it. | Set to 1 if the STA supports reception of a Multi-STA BlockAck frame that has a 32 bit BlockAck Bitmap intended to it.Set to 0 otherwise. |
| MU Cascading Supported | Indicates whether the STA supports participating in an MU Cascading sequence (see 25.5.3 (MU cascading operating). | Set to 1 if the STA supports MU cascading operation.Set to 0 otherwise. |
| Ack-enabled Multi-TID Aggregation Support | Indicates support by a STA to receive a multi-TID A-MPDU that can solicit either Ack or BlockAck, or both, as described in 25.10.4 (A-MPDUs with multiple TIDs).  | Set to 1 when the STA supports reception of this multi-TID A-MPDU format.Set to 0 otherwise. |
| Group Addressed Multi-STA BlockAck In DL MU Support | Indicates support by a non-AP STA for the reception of a group-addressed Multi-STA BlockAck frame that is sent in a DL MU PPDU in a non-broadcast RU. | Set to 1 when the STA supports its reception.Set to 0 otherwise. |
| OMI A-Control Support | Indicates support for receiving an MPDU that contains an OMI A-Control field. | If +HTC-HE Support is 1:Set to 1 if the STA supports reception of the OMI A-Control field.Set to 0 otherwise.Reserved if +HTC-HE Support is 0. |
| OFDMA RA Supports | Indicates support for a non-AP STA to follow the OFDMA random access procedure and for an AP to send Trigger frames that allocate random RUs (see 25.5.3.6 (UL OFDMA-based random access). | Set to 1 when the STA supports it.Set to 0 otherwise. |

**9.4.2.213.2 HE PHY Capabilities Information field**

***Note to Editor: This subclause is expected to contain the contents of the document 11-16-1170.***

**9.4.2.213.4 PPE Thresholds field**

The format of the PPE Thresholds field is defined in Figure 9-ax3 (PPE Thresholds field format)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B2 | B3 B6 |  |  |
|  | NSS M1 | RU Index Bitmask | PPE Thresholds Info | PPE Pad |
| Bits: | 3 | 4 | Variable | variable |

**Figure 9-ax3—PPE Thresholds field format**

The NSS M1 subfield contains an unsigned integer that is equal to the number of NSS values minus one for which PPE threshold values are included in the PPE Thresholds Info field.

The RU Index Bitmask subfield contains a bitmask which indicates whether PPE threshold values are present for each of four RU allocation sizes according to their RU Allocation Index values. For example, when B3 is set to 1, PPE threshold values are present for the RU allocation corresponding to RU allocation index 0 and when B3 is set to 0, PPE threshold values are not present for the RU allocation corresponding to RU allocation index 0.

The PPE Threshold Info field is (NSS M1 + 1)  (Number of bits set to 1 in the RU Index Bitmask subfield) 6 bits in length. The format of the PPE Threshold Info field is defined in Figure 9-ax4 (PPE Thresholds Info field format). PPE threshold values appear in increasing NSS value and increasing RU index value order, where lower-numbered PPE Thresholds Info field bits contain PPE threshold values corresponding to lower numbered NSS values and within a set of PPE Threshold subfields corresponding to a single value of NSS, lower-numbered PPE Thresholds Info field bits contain PPE threshold values corresponding to lower numbered RU index values. Subfields PPET16 for NSS*n* for RU*b* and PPET8 for NSS*n* for RU*b* are present for all values of *n* and *b* where:

 1 <= *n* <= (NSS M1 + 1)

*b* = [*x*, …, *m*]

where [*x*, …, *m*] is the set of integers equal to the ordered list of bit positions of all bits that are set to 1 in the RU Index Bitmask subfield, with *x* being the lowest value

**TGax Editor: *In Figure 9-ax4 – PPE Threholds Info field format, change “RU1” to “RUx” in the two places in which it appears***

Each PPET8 for NSS*n* for RU*b* subfield and PPET16 for NSS*n* for RU*b* subfield contains an unsigned integer which corresponds to a constellation index value related to the transmission constellation of an HE PPDU as defined in Table 9-ax15 (Constellation index).

The PPET8 for NSS*n* for RU*b* subfield and PPET16 for NSS*n* for RU*b* subfield values are combined to determine the Maximum PE value for HE PPDUs that are transmitted to the STA sending this field and using NSS=*n* and an RU allocation corresponding to RU Allocation Index *b*, for each value of NSS and RU specified by the field. For all values of *n* and *b* for which PPET8 and PPET16 are not present, the Maximum PE value is 0 for HE PPDUs that are transmitted to the STA using NSS=*n* and an RU allocation corresponding to RU Allocation Index *b*.. The value for each PPET8 for NSS*n* for RU*m* is always less than the value of PPET16 for NSS*n* for RU*m*. The encoding is described in Table 9-ax16 (PPET8 and PPET16 encoding).

**Table 9-ax16—PPET8 and PPET16 encoding**

|  |  |  |
| --- | --- | --- |
| Result of comparison of the constellation index *x* of an HE PPDU with NSS value *n* and RU Allocation size that corresponds to the RU Allocation index = (*b* + DCM) to the value in the PPET8 for NSS*n* for RU*m* subfield | Result of comparison of the constellation index of an HE PPDU with NSS value n and RU Allocation size that corresponds to the RU Allocation index = (*b* + DCM) to the value in the PPET16 for NSSn for RUm subfield | Maximum PE value for an HE PPDU transmitted to this STA using the constellation index = x, NSS = n and RU Allocation size that corresponds to the RU Allocation index = (*b* + DCM) |
|  |  |  |
| X greater than or equal PPET8 | X less than PPET16 or PPET16 equal to None | 8 s |
| X greater than PPET8 or PPET8 equal to None | X greater than or equal PPET16 | 16 s |
|  |  |  |
|  |  |  |
| All other combinations not othwerise listed in this table | 0 s |
| Note: DCM = 1 when the HE PPDU uses DCM; DCM = 0 otherwise.  |

The RU Allocation Index encoding is indicated in Table 9-ax17 (RU Allocation Index encoding).

**Table 9-ax17— RU Allocation Index encoding**

|  |  |
| --- | --- |
| **RU Allocation Index value** | **RU Allocation size** |
| 0 | 242 |
| 1 | 484 |
| 2 | 996 |
| 3 | 2x996 |

The PPE Pad field contains all zeros. The number of bits in the PPE Pad field is the number of bits required to round the length of the PPE Thresholds Info field up to the next integer number(#1895) of octets.

***Note to Editor: This subclause to appear prior to 9.4.2.213.3. The disorder is for ease of review of the changes with respect to the baseline text.***

**9.4.2.213.3 Tx Rx HE MCS Support field**

The Tx Rx HE MCS Support field format is defined in Figure 9-ax7b (Tx Rx HE MCS Support field format)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | Highest NSS Supported M1 | Highest MCS Supported | Tx BW Bitmap | Rx BW Bitmap | Tx MCS NSS Descriptors | Rx MCS NSS Descriptors |
| Bits: | 3 | 3 | 5 | 5 | n x 8 | m x 8 |

**Figure 9-ax7b— Tx Rx HE MCS Support field format**

The Highest NSS Supported M1 subfield indicates the highest NSS value supported by the STA that transmitted this subfield. The Highest NSS Supported M1 value is applicable to both transmissions and receptions but does not necessarily apply to all combinations of PPDU bandwidth and MCS. The PPDU bandwidth and MCS values that do not support the NSS value indicated in this subfield are described in the Tx MCS NSS Descriptors and Rx MCS NSS Descriptors, if present. If no Tx MCS NSS Descriptors are present, then the STA supports transmission of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields. If no Rx MCS NSS Descriptors are present, then the STA supports reception of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields. The highest NSS supported by the STA is equal to the value of the Highest NSS Supported M1 field plus 1.

The Highest MCS Supported subfield indicates whether the STA transmitting this subfield supports the optional MCS values of MCS8, MCS9, MCS10, MCS11. The encoding of this field is defined in Table 9-ax17y (Highest MCS Supported subfield encoding). The Highest MCS Supported value is applicable to both transmissions and receptions but does not necessarily apply to all combinations of PPDU bandwidth and NSS. The PPDU bandwidth and NSS values that do not support the MCS value indicated in this subfield are described in the Tx MCS NSS Descriptors and Rx MCS NSS Descriptors fields, if present. If no Tx MCS NSS Descriptors are present, then the STA supports transmission of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields. If no Rx MCS NSS Descriptors are present, then the STA supports reception of all combinations of PPDU bandwidth identified by the Channel Bandwidth Set field at each NSS and MCS indicated in the Highest NSS Supported M1 and Highest MCS Supported subfields.

**Table 9-ax17y— Highest MCS Supported subfield encoding**

|  |  |
| --- | --- |
| **Highest MCS Supported subfield value** | **Highest supported MCS of the transmitting STA** |
| 0 | MCS7 |
| 1 | MCS8 |
| 2 | MCS9 |
| 3 | MCS10 |
| 4 | MCS11 |
| 5 -7 | Reserved |

Each bit of the Tx BW Bitmap indicates whether a set of TX MCS NSS Descriptor field(s) are present for a specific PPDU bandwidth. The bits correspond to the ordered set of PPDU bandwidth values of 20 MHz, 40 MHz, 80 MHz, 80+80 and 160 MHz with the bit in the lowest numbered bit position corresponding to 20 MHz. A bit in the Tx BW Bitmap is set to 1 to indicate that the corresponding Tx MCS NSS Descriptor for that bandwidth is present; otherwise the bit is set to 0.

Each Tx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation and for all MCS that are higher than the indicated MCS up to but not including the next MCS in the set for this bandwidth. MCS values that are lower than the lowest specified MCS within a set of Tx MCS NSS Descriptor fields implicitly support transmission of PPDUs using the highest NSS value indicated in the Highest NSS Supported subfield.

Each bit of the Rx BW Bitmap indicates whether a set of RX MCS NSS Descriptor field(s) are present for a specific bandwidth of operation. The bits correspond to the ordered set of PPDU values of 20 MHz, 40 MHz, 80 MHz, 80+80 and 160 MHz with the bit in the lowest numbered bit position corresponding to 20 MHz. A bit in the Rx BW Bitmap is set to 1 to indicate that the corresponding Rx MCS NSS Descriptor for that bandwidth is present; otherwise the bit is set to 0.

If all of the bits of the Tx BW Bitmap subfield and all of the bits of the Rx BW Bitmap subfield are zero, then none of the subfields of the Tx Rx HE MCS Support field beyond Highest MCS Supported need to be present. If either the Tx BW Bitmap subfield or the Rx BW Bitmap subfield has at least one bit set to 1, then both the Tx BW Bitmap subfield and the Rx BW Bitmap subfield are present, even if one of these subfields has the value of all zeros.

Each Rx MCS NSS Descriptor indicates the value of the highest supported NSS for the indicated MCS for a specific bandwidth of operation and for all MCS that are higher than the indicated MCS up to but not including the next MCS in the set for this bandwidth. MCS values that are lower than the lowest specified MCS within a set of Rx MCS NSS Descriptor fields implicitly support reception of PPDUs using the highest NSS value indicated in the Highest NSS Supported subfield

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B3 | B4 B6 | B7 |
|  | MCS | NSS | Last MCS NSS  |
| Bits: | 4 | 3 | 1 |

**Figure 9-ax7c— Tx MCS NSS Descriptor and Rx MCS NSS Descriptor subfield format**

The MCS subfield of the Tx MCS NSS Descriptor and Rx MCS NSS Descriptor subfields indicates an MCS value encoded as an unsigned integer.

The NSS subfield of the Tx MCS NSS Descriptor and Rx MCS NSS Descriptor subfields indicates an NSS value encoded as an unsigned integer. The NSS indicated by the field corresponds to the MCS value in the same Tx MCS NSS Descriptor or Rx MCS NSS Descriptor subfield. The value 0 indicates that there is no support for this combination of PPDU bandwidth and this MCS and higher.

The Last MCS NSS subfield indicates the last Tx MCS NSS Descriptor or Rx MCS NSS Descriptor for a set of Tx MCS NSS Descriptors or Rx MCS NSS Descriptors corresponding to a single PPDU bandwidth value. The Last MCS NSS subfield is set to 1 to indicate that the current Tx MCS NSS Descriptor or Rx MCS NSS Descriptor is the last descriptor for the corresponding PPDU bandwidth. Otherwise the subfield is set to 0.

**CID 667, 1343, 117, 1347**

**TGax Editor: *make the changes shown:***

**9.4.2.214 HE Operation element**

The operation of HE STAs in an HE BSS is controlled by the HT Operation element, the VHT Operation element and the HE Operation element. The format of the HE Operation element is defined in Figure 9-ax5 (HE Operation element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | HE Operation Parameters | Basic HE MCS and NSS Set |
| Octets: | 1 | 1 | 2 | 2 |

**Figure 9-ax5—HE Operation element format**

The Element ID and Length fields are defined in 9.4.2.1 (General).

The format of the HE Operation Parameters field is defined in Figure 9-ax6 (HE Operation Parameters field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B5 | B6 B8 | B9 | B10 B15 |
|  | BSS Color | Default PE Duration | TWT Required | Reserved |
| Bits: | 6(#244) | 3(#1) | 1 | 6(#Ed) |

**Figure 9-ax6 — HE Operation Parameters(#1350) field format**

The BSS Color field is an unsigned integer whose value is the BSS color of the BSS corresponding to the AP which transmitted this element, except that a value of 0 in this field indicates that there is no BSS color for this BSS.

The BSS Color field is an unsigned integer whose value is the BSS Color of the BSS corresponding to the AP, IBSS STA, mesh STA or TDLS STA that transmitted this element, except that a value of 0 in this field is used if one or more intended recipient STAs of an HE PPDU is not a member of a transmitting STA's BSS.

The Default PE Duration subfield indicates the PE duration in units of 4 μs, for an HE trigger-based PPDU that is solicited with UL MU Response Scheduling in the A-Control subfield. Values 5-7 of the Default PE Duration subfield are reserved.

The TWT Required subfield indicates that the AP requires the HE non-AP STAs to operate in the role of either TWT requesting STA, as described 25.7.2 (Individual TWT agreements), or TWT scheduled STA, as described in 25.7.3 (Broadcast TWT operation). The TWT Required subfield is set to 1 whenthe AP requires such functionality; otherwise it is set to 0.*(#1640)*

The Basic HE MCS and NSS Set field indicates the HE-MCSs for each number of spatial streams in HE PPDUs that are supported by all HE STAs in the BSS (including IBSS and MBSS). The Basic HE MCS And NSS Set field is a bitmap of size 16 bits; each 2 bits indicates the supported HE-MCS set for *NSS* from 1 to 8. The Basic HE-MCS And NSS Set field is defined in Figure 9-ax6b (Basic HE-MCS And NSS Set field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 B3 | B4 B5 | B6 B7 | B8 B9 | B10 B11 | B12 B13 | B14 B15 |
|  | Max HE MCS For 1 SS | Max HE MCS For 2 SS | Max HE MCS For 3 SS | Max HE MCS For 4 SS | Max HE MCS For 5 SS | Max HE MCS For 6 SS | Max HE MCS For 7 SS | Max HE MCS For 8 SS |
| Bits: | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

**Figure 9-ax6b Basic HE-MCS And NSS Set field format**

**TGax Editor: *modify the text as shown:***

**25.5 MU operation**

**25.5.1 HE DL MU operation**

**25.5.1.1 General**

HE DL MU operation allows an AP to transmit simultaneously to one or more non-AP STAs in DL OFDMA, DL MU-MIMO or both.

An AP shall not transmit to a STA an HE MU PPDU with the HE-SIG-B allocating more than one RU (see 26.3.9.8.3 (Time domain encoding)), unless the STA set the DL OFDMA Capable subfield of the HE Capabilities element to 1.

An AP shall not transmit to a STA an HE MU PPDU with the HE-SIG-B allocating spatial streams to more than one recipient STA, unless the STA set the DL MU-MIMO Capable subfield of the HE Capabilities element to 1.

The transmission for all the STAs in an HE MU PPDU in either DL OFDMA or DL MU-MIMO shall end at the same time, indicated by the L-SIG field as described in 26.3.9.5 (L-SIG).

The padding procedure for each A-MPDU in an HE MU PPDU is the same as for an A-MPDU in a VHT PPDU and defined in 10.13.6 (A-MPDU padding for VHT PPDU).

A STA shall not transmit a DL OFDMA With MIMO PPDU that contains a unicast RA that corresponds to a STA from which it has not received an HE Capabilities element with the DL OFDMA With MIMO Support bit set to 1.

**TGax Editor: *modify the text as shown:***

**25.5.2 UL MU operation**

**25.5.2.1 General**

The UL MU operation allows an AP to solicit simultaneous immediate response frames(#1513) from one or more non-AP STAs. Non-AP STAs transmit their response frames using(#1514) HE trigger-based PPDU format, in either UL OFDMA(#1515),(#431) UL MU-MIMO, or both.

An HE STA with dot11ULOFDMAOptionImplemented(#1515) set to true shall set the UL OFDMA Capable(#1515) subfield of the HE Capabilities element it transmits to 1. Otherwise, the HE STA shall set the UL OFDMA Capable subfield of the HE Capabilities element it transmits to 0(#417).

An HE STA with dot11ULMUMIMOOptionImplemented set to true shall set the UL MU-MIMO(#1507) Capable subfield of the HE Capabilities element it transmits to 1. Otherwise, the HE STA shall set UL MUMIMO Capable subfield of the HE Capabilities element it transmits to 0(#417).

A non-AP STA with dot11ULOFDMAOptionImplemented(#1515) or dot11ULMUMIMOOptionImplemented equal to true is referred to as an UL MU capable STA.

An HE STA shall set the UL MU Response Scheduling Support subfield of the HE Capabilities element it transmits to 1 if its dot11HEULMUResponseSchedulingOptionImplemented is true; otherwise the STA shall set it to 0.(#1)

A STA shall not transmit a trigger frame soliciting a UL OFDMA With MIMO PPDU from a STA from which it has not received an HE Capabilities element with the UL OFDMA With MIMO Support bit set to 1.

A STA shall not transmit a trigger frame soliciting a Full BW UL MU MIMO PPDU from a STA from which it has not received from which it has not received an HE Capabilities element with the Full BW UL MU MIMO Support bit set to 1.

A STA transmitting an UL OFDMA PPDU shall operate as either a class A or class B device as defined in 26.3.14 (Transmit requirements for an HE trigger-based PPD). A STA that is a class A device shall set the Class A subfield in HE Capabilities elements that it transmits to 1. A STA that is a class B device shall set the Class A subfield in HE Capabilities elements that it transmits to 0. (#1343)

**CID 1803**

**TGax Editor: *insert the following paragraph to precede the fifth paragraph of subclause 25.7.1 General***

**25.7 TWT operation**

**25.7.1 General**

An HE AP shall set the TWT Responder Support subfields of the Extended Capabilities element and HE Capabilities element to 1.

**CID 198, 2253, 2425, 197, 2426, 1314, 2427**

**9.3.3.5 Association Request frame format**

**TGax Editor: *remove the HE Operation element from Table 9-29 Association Request frame body***

**9.3.3.7 Reassociation Request frame format**

**TGax Editor: *remove the HE Operation element from Table 9-31 Reassociation Request frame body***

**9.3.3.9 Probe Request frame format**

**TGax Editor: *remove the HE Operation element from Table 9-33 Probe Request frame body***

**CID 1152**

**6.3.11.2.2 Semantics of the service primitive**

**TGax Editor: *remove the words “BSSType = INFRASTRUCTURE and” from the entry in the Description column of the row containing “HE Operation” in the Name column of the parameter description table located within subcluase 6.3.11.2.2 Semantics of the service primitive which is itself located within the subclause 6.3.11.2 MLME-START.request***