IEEE P802.11
Wireless LANs

|  |
| --- |
| Comment resolutions for miscellaneous CIDs in clause 26.8 |
| Date: 2020-06-01 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Alfred Asterjadhi | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 | +1-858-658-5302 | aasterja@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Inc. |  |  |  |
| George Cherian | Qualcomm Inc. |  |  |  |

Abstract

This submission proposes resolutions for multiple comments related to TGax D6.0 with the following CIDs (16 CIDs):

* 24104, 24268, 24276, 24277, 24278, 24341, 24342, 24343, 24436, 24437,
* 24440, 24441, 24451, 24452, 24548, 24569

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Includes suggestions received from Mark. Changes highlighted in green.
* Rev 2: Added resolution to CIDs 24104, and rest of CIDs amended as per suggestions received during the presentation. Changes highlighted in this color.
* Rev 3: Addresses some more comments from Mark. Changes highlighted in this color. CIDs 24104 and 24569 will be finalized next revision, hence currently deferred.
* Rev 4: Finished addressing comments for CID 24104 and CID 24569. Rest of CIDs still (used to) refer to Rev3 since they are already motined. Changes highlighted in yellow.
* Rev 5: Removed two combinations of punctured modes (HE-CBW-PUNC80-PRI, HE-CBW-PUNC80-SEC) from the modes disallowed for use in the SST case. Changes are not highlighted as it is a removal of an inserted text.
* Rev 6: Incoprorated minor editorial suggestions from Mark. Changes still in yellow.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 24104 | Kim, Youhan | 410.15 | If an 80 MHz operating HE SST non-AP STA operates in the Secondary 80 MHz, which 20 MHz (within the Secondary 80 MHz) should be used to detect packets? For example, let 20\_1, 20\_2, ..., 20\_8 be the eight 20 MHz channels comprising an 160 MHz channel, with 20\_1 being the 20 MHz channel lowest in frequency, and 20\_8 being the one highest in frequency. Let 20\_1 be the Primary 20 MHz. The HE SST non-AP STA is in Secondary 80, i.e., 20\_5 + 20\_6 + 20\_7 + 20\_8. AP does not know which of these four 20 MHz channels is used by the STA to detect the preamble. Suppose the AP transmits an HE MU PPDU which the 20\_5 punctured, and that happens to be the 20 MHz used by the STA to detect the packet. Then the packet cannot be received by the STA.Also, suppose somehow the AP/STA negotiated that STA would use 20\_5 to detect the preamble. What if the AP sends an HE MU PPDU with 20\_2 (Secondary 20) and 20\_8 punctured? What value should be used for the Bandwidth field in the HE-SIG-A? For Primary 80, value 6 makes sense, but for Secondary 80, value 7 makes sense. But an HE MU PPDU cannot have different HE-SIG-A content per 20 MHz. | State that an AP shall not use preamble puncturing when transmitting packets to 80 MHz operating HE SST non-AP STA. Also, consider updating SST protocol to have the AP and 80 MHz SST STA negotiate which 20 MHz is used for preamble detection in the Secondary 80. Or, remove 80 MHz mode from SST. | Revised –Agree in principle with the comment. Proposed resolution is inline with the first suggested change. As per the second comment regarding the preamble detect, please note that STAs only respond to Trigger frames, for which CCA does not require preamble detect, but rather only ED-CCA. Hence there is no need to negotiate PD.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24104. |
| 24268 | Fischer, Matthew | 407.38 | The TWT Information frame is a management frame for which reception and parsing at the receiving STA can be incovenient but is currently the only effective means for a STA to cause an early termination of a TWT SP, even though it is not listed in the early termination events! There needs to be a more convenient mechanism for a STA to cause a TWT SP early termination. Suggest using an A control value to signal a STA state transition with timing information. Also, the receipt of a TWT information frame at the TWT responding STA is not currently included in the early termination events. | Add the receipt of a TWT information frame with certain conditions/values as an early termination event of a TWT SP that is initiated by the TWT requesting STA. Also, include a mechanism for signaling STA state transition which can be used by a STA to create an early termination of a TWT SP, such as is described in 11-18-1821 | Revised—Disagree in principle regarding the definition of yet another mechanism to provide the same functionality that TWT Information frame already provides. This is because adding another mode simply adds to the complexity. Also, the term “inconvenient” is extremely ambiguous and it makes it impossible to determine what(if any) makes a certain frame inconvenient. Regarding the claim that TWT Information frames sent by non-AP STAs being not part of the early TWT SP termination events, that is not quite correct because there are explicit references to the subclasues where these additional events are defined. Quoting:“Additional TWT SP termination events for a TWT requesting STA occur after the acknowledgment of a TWT Information frame as defined in 26.8.4.2 (TWT Information frame exchange for individual TWT) and in 26.8.4.4 (TWT Information frame exchange for flexible wake time). To make it clearer that these are part of the TWT SP termination event the proposed resolution moves those two paragraphs as part of the itemized list.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24268. |
| 24276 | Levy, Joseph | 388.51 | TWT operation is not defined as a PS mode it is orthogonal to the PS mode. It is my understanding that a STA need not be in PS mode to have a TWT schedule. | "Replace: ""to reduce the required amount of time that a STA in PS mode needs to be awake.""With: ""may allow a non-AP STA to conserve power.""" | Revised –TWT operation is also a power save mode because a STA that is in PS mode wakes in pre-defined schedules that it has negotiated with the AP. Agree that the STA need not be in PS mode to have a TWT schedule, hence the reason for specifying that it helps to reduce the required amount of time that a STA in PS mode needs to be awake (in the cited text). Proposed resolution is to amend the cited text to be compliant with a similar text that is present in the baseline TWT subclause in REVmd D3.3. TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24276. |
| 24277 | Levy, Joseph | 390.57 | In the example the STAs may go to doze state during the indicated times, but they are not required to. Also, this doze period only applies to this particular individual TWT agreement, and a STA may have additional TWT agreements. This should be clear in the specification. | Insert "may" after "and" and before "go to doze state" | Rejected –This particular paragraph is providing some description for the figure above, wherein the STAs are shown as effectively going to doze state. Please note that from a normative behavior that is correct, i.e., that there is no requirement for the STA to do so. But for correctly describing what is being reflected in the figure there should not be added a “may”. |
| 24278 | Levy, Joseph | 393.17 | This paragraph is very confusing and should be clarified. I understand that a TWT responding STA can receive a PS-Poll frame or a U-APSD trigger frame at any time as state of the responding STA may be either doze or awake at any time. But, if the responding STA is following the TWT schedule it may be in doze state prior to the TWT SP - if so how can it receive a frame? If it does receive a PS-Poll frame or a U-APSD trigger frame from the TWT requesting STA how does it determine that the TWT requesting STA will be awake? Also, how will it determine if the TWT requesting STA has not entered the doze state? | Please clarify the STA behavior. | Revised—The commenter is asking several questions, the answers to which are as follows: 1) The TWT responding STA in this particular subclause is the AP which by default does not go to doze state. There is one mode that would allow the AP to be in doze state outside of TWT SPs (when Responder PM bit is set to 1) but even in that case the AP would be receiving the frame only if it is in the awake state. So the answer is the responding STA may receive the frame if it is in the awake state. 2) Just by receiving the frame the TWT responding STA can determine that the TWT requesting STA is awake (since it sent the frame). 3) The TWT requesting STA that has declared to be in the awake state cannot enter the doze state unless explicitly allowed to or the TWT SP ends. Hence an explicit indication or termination of a TWT SP is sufficient to determine that the STA has entered (or not) the doze state.The proposed resolution is to explicitly state that the TWT responder STA of a trigger-enabled TWT agreement is an HE AP.  TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24278. |
| 24341 | RISON, Mark | 407.00 | "It is not clear whether a non-AP STA might set the EOSP bit in the QoS Control field, in the context of ax TWT.The following suggest it can:407.40 ""The transmission by the TWT requesting STA or TWT scheduled STA of an acknowledgmentin response to an individually addressed QoS Data or QoS Null frame sent by the \*\*\*TWTresponding STA\*\*\* or TWT scheduling AP, respectively, that had the EOSP subfield equal to 1.""407.50 ""The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent bythe \*\*\*TWT responding STA\*\*\* or TWT scheduling AP, that does not solicit an immediate responseand with the EOSP subfield equal to 1.""In both cases the ""TWT something STA or TWT scheduling AP"" indicates that the TWT something STAis not an AP.Indeed, the first of these is equivalent to (by distributing the ""respectively):""... an individually addressed QoS Data sent by the TWT responding STA or QoS Null frame sentby the TWT scheduling AP, that had the EOSP subfield equal to 1""i.e. only the TWT scheduling AP can send a QoS Null, not the TWT responding STA.However, discussions with some TGax participants have suggested that they think anon-AP STA can never set the EOSP bit in the context of ax TWT." | As it says in the comment | Revised –Only APs can set the EOSP subfield to 1 in a BSS (inherited from baseline PS modes), although non-AP STAs may do so in certain configurations, e.g., as part of a TDLS communication. In these sentences, the use of respectively might create ambiguity as to which STA (requesting, scheduled or responding or scheduling) is sending the frames with EOSP field set to 1. Proposed resolution is to split the sentences so that the use of respectively which brings confusion is avoided.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24341. |
| 24342 | RISON, Mark | 407.00 | "It is not clear whether a non-AP STA might set the EOSP bit in the QoS Control field, in the context of ax TWT.The following suggest it can:407.40 ""The transmission by the TWT requesting STA or TWT scheduled STA of an acknowledgmentin response to an individually addressed QoS Data or QoS Null frame sent by the \*\*\*TWTresponding STA\*\*\* or TWT scheduling AP, respectively, that had the EOSP subfield equal to 1.""407.50 ""The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent bythe \*\*\*TWT responding STA\*\*\* or TWT scheduling AP, that does not solicit an immediate responseand with the EOSP subfield equal to 1.""In both cases the ""TWT something STA or TWT scheduling AP"" indicates that the TWT something STAis not an AP.Indeed, the first of these is equivalent to (by distributing the ""respectively):""... an individually addressed QoS Data sent by the TWT responding STA or QoS Null frame sentby the TWT scheduling AP, that had the EOSP subfield equal to 1""i.e. only the TWT scheduling AP can send a QoS Null, not the TWT responding STA.However, discussions with some TGax participants have suggested that they think anon-AP STA can never set the EOSP bit in the context of ax TWT." | "Change the cited text at 407.40 to ""The transmission by the TWT scheduled STA of an acknowledgmentin response to an individually addressed QoS Null frame sent by the TWT scheduling AP that had the EOSP subfield equal to 1.""Change the cited text at 407.50 to ""The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent bythe TWT scheduling AP, that does not solicit an immediate responseand with the EOSP subfield equal to 1.""" | Revised –Only APs can set the EOSP subfield to 1 in a BSS (inherited from baseline PS modes), although non-AP STAs may do so in certain configurations, e.g., as part of a TDLS communication. In these sentences, the use of respectively might create ambiguity as to which STA (requesting, scheduled or responding or scheduling) is sending the frames with EOSP field set to 1. Proposed resolution is to split the sentences so that the use of respectively which brings confusion is avoided.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24342. |
| 24343 | RISON, Mark | 407.00 | "It is not clear whether a non-AP STA might set the EOSP bit in the QoS Control field, in the context of ax TWT.The following suggest it can:407.40 ""The transmission by the TWT requesting STA or TWT scheduled STA of an acknowledgmentin response to an individually addressed QoS Data or QoS Null frame sent by the \*\*\*TWTresponding STA\*\*\* or TWT scheduling AP, respectively, that had the EOSP subfield equal to 1.""407.50 ""The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent bythe \*\*\*TWT responding STA\*\*\* or TWT scheduling AP, that does not solicit an immediate responseand with the EOSP subfield equal to 1.""In both cases the ""TWT something STA or TWT scheduling AP"" indicates that the TWT something STAis not an AP.Indeed, the first of these is equivalent to (by distributing the ""respectively):""... an individually addressed QoS Data sent by the TWT responding STA or QoS Null frame sentby the TWT scheduling AP, that had the EOSP subfield equal to 1""i.e. only the TWT scheduling AP can send a QoS Null, not the TWT responding STA.However, discussions with some TGax participants have suggested that they think anon-AP STA can never set the EOSP bit in the context of ax TWT." | "Change the cited text at 407.40 to ""The transmission by the TWT scheduled STA of an acknowledgmentin response to an individually addressed QoS Data or QoS Null frame sent by the TWT scheduling AP that had the EOSP subfield equal to 1.""Change the cited text at 407.50 to ""The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent bythe TWT scheduling AP, that does not solicit an immediate responseand with the EOSP subfield equal to 1.""" | Revised –Only APs can set the EOSP subfield to 1 in a BSS (inherited from baseline PS modes), although non-AP STAs may do so in certain configurations, e.g., as part of a TDLS communication. In these sentences, the use of respectively might create ambiguity as to which STA (requesting, scheduled or responding or scheduling) is sending the frames with EOSP field set to 1. Proposed resolution is to split the sentences so that the use of respectively which brings confusion is avoided.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24343. |
| 24436 | RISON, Mark | 410.06 | There are references to SST STAs (181.58) but it is not clear whether HE SST STAs are SST STAs | At 410.6 add "An HE STA with dot11HESubchannelSelectiveTransmissionImplemented true is an HE SST STA. An HE SST STA is not an SST STA." | Revised –Draft, has definitions for SST non-AP STA, and SST AP. In order to avoid adding yet another definition, the proposed resolution is to replace the term SST STA with either SST non-AP STA or SST AP.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24436. |
| 24437 | RISON, Mark | 410.01 | There are definitions of HE SST non-AP STA and HE SST AP, but not HE SST STA, a term which is used elsewhere | At 410.6 add "An HE STA with dot11HESubchannelSelectiveTransmissionImplemented true is an HE SST STA. An HE SST STA is not an SST STA." | Revised –Proposed resolution is to explicitly call out HE SST non-AP STA and HE SST AP every time so that it is not needed to define another term for the generic STA case.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24437. |
| 24440 | RISON, Mark |  | "26.8.2 says ""NOTE 2--The Trigger frame can be replaced by a frame carrying a TRS Control subfield provided that the frame is car-ried in a DL MU PPDU and the AP allocates enough resources in the HE TB PPDU for the STA to at least deliver itsBSRs in response to the soliciting DL MU PPDU. In this case, the AP is recommended to allocate enough resources insubsequent Trigger frames sent during the TWT SP so that the STA can send as much as possible of the data reported inthe BSR."". 26.8.3.2 says ""NOTE 3--The Trigger frame can be replaced by a frame carrying a TRS Control subfield provided that the frame is car-ried in a DL MU PPDU and the AP allocates enough resources in the HE TB PPDU for the STA to at least deliver itsBSRs in response to the soliciting DL MU PPDU. In this case it is recommended to allocate enough resources in subse-quent Trigger frames sent during the TWT SP so that the STA can send as much as possible of the data reported in theBSR."" The second one nearly duplicates the first, and the first is better (clearer ""AP"" v ""it"")" | Copy the text of the NOTE from 26.8.2 to the corresponding NOTE in 26.8.3.2 | Accepted |
| 24441 | RISON, Mark | 392.55 | "NOTE 2--The Trigger frame can be replaced by a frame carrying a TRS Control subfield" -- since this is a NOTE, it is not normative | Change "Trigger frame" to "triggering frame" throughout Subclause 26.8 | Revised –The MPDU containing a TRS Control field is a particular case for the operation which has limited functionality, while using the Trigger frame is the generic case for the operation. TRS Control fields can only solicit MPDUs that do not solicit Ack, while Trigger frame (more in particular Basic Trigger frame) can solict MPDUs that solicit Ack).Proposed resolution is to add the TRS Control field as an exception to the main normative behavior sentence, in two separate places.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24441. |
| 24451 | RISON, Mark | 393.18 | "during or before an announced TWT SP" -- "during or before" a periodic event is equivalent to "always", since the time after instance n of the event is before instance n+1 of the event. The "but after the end of the most recent TWT SP" does not help, because everything is always preceded by a TWT SP (well, OK, not for the very first one) | "Delete ""during or before an announced TWT SP but after the end ofthe most recent TWT SP,"" in the referenced subclause and in 26.8.3.2" | Revised –Proposed change is to further clarify that the sentence refers to the interval between a specific TWT SP and the end of the most recent TWT SP that precedes that specific TWT SP (if any). TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24451. |
| 24452 | RISON, Mark | 393.18 | "during or before an announced TWT SP" -- "during or before" a periodic event is equivalent to "always", since the time after instance n of the event is before instance n+1 of the event. The "but after the end of the most recent TWT SP" does not help, because everything is always preceded by a TWT SP (well, OK, not for the very first one) | "Change ""during or before an announced TWT SP but after the end ofthe most recent TWT SP,"" to ""in the interval of time between the end of the TWT SP that has most recently ended, and the end of the TWT SP that next follows"" in the referenced subclause and in 26.8.3.2" | Revised –Proposed change is to further clarify that the sentence refers to the interval between a specific TWT SP and the end of the most recent TWT SP that precedes that specific TWT SP (if any). TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24452. |
| 24548 | Hamilton, Mark | 393.18 | What is an "announced TWT SP"? Also, what is an "unannounced TWT SP"? Both terms appear to be used with technical meaning critical to understanding the enclosing sentence. | Define these terms. | Revised –There are terms that are already defined in the baseline. For example, please refer to P1396L1-10: “The Flow Type subfield indicates the type of interaction between the TWT requesting STA and the TWT responding STA at a TWT. Setting the Flow Type subfield to 0 indicates an announced TWT in which the TWT requesting STA will send a PS-Poll or an APSD trigger frame (see 11.2.3.5 (Power management with APSD)) to signal its awake state to the TWT responding STA before a frame is sent from the TWT responding STA to the TWT requesting STA. Setting the Flow Type subfield to 1 indicates an unannounced TWT in which the TWT responding STA will send a frame to the TWT requesting STA at TWT without waiting to receive a PS-Poll or an APSD trigger frame from the TWT requesting STA.”Proposed resolution is to also define the TWT SP counterparts, for each of them.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24548. |
| 24569 | Sun, Li-Hsiang | 401.18 | """A broadcast TWT schedule is either created oralready exists and is using the TWT parametersidentified in the resp"" is not consistent with the same row in Table 10-31" | Make them consistent | Revised –Agree in principle with the comment. Proposed resolution makes them consistent as per suggestion.TGax editor to make the changes shown in 11-20/0819r6 under all headings that include CID 24569. |

**Discussion: *None.***

* TWT operation
* General

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24276):***

Target wake time (TWT) allows an AP to manage activity in the BSS in order to minimize contention between STAs and to reduce the required amount of time that a STA utilizing a power management mode needs to be awake. This is achieved by allocating STAs to operate at nonoverlapping times and/or frequencies, and concentrate the frame exchanges in predefined service periods. *(#24276)*

…

* Individual TWT agreements

**…**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24278):***

An HE STA that successfully sets up a TWT agreement with another HE STA shall follow the rules defined in 10.47.1 (TWT overview) and 10.47.4 (Implicit TWT operation), except that all the additional rules defined in 26.8 (TWT operation) supersede all the respective rules defined in 10.47.1 (TWT overview) and 10.47.4 (Implicit TWT operation). A TWT or TWT SP that is set up under an implicit TWT agreement is an implicit TWT or implicit TWT SP, respectively (see 10.47.1 (TWT overview)). A TWT or TWT SP that is set up under a trigger-enabled TWT agreement is a trigger-enabled TWT or trigger-enabled TWT SP, respectively. The TWT responding STA of a trigger-enabled TWT agreement is an HE AP. *(#24278)*

**…**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24441):***

The TWT responding STA of a trigger-enabled TWT agreement shall schedule for transmission a Trigger frame for the TWT requesting STA, as described in 26.5.2 (UL MU operation), within each TWT SP for that TWT agreement except that the Trigger frame may be replaced by a frame carrying a TRS Control subfield provided that the frame is carried in a DL MU PPDU and the AP allocates enough resources in the HE TB PPDU for the STA to at least deliver its BSRs in response to the soliciting DL MU PPDU.*(#24441)* The TWT responding STA should solicit buffer status reports from the TWT requesting STA at the start of the TWT SP following the procedure described in 26.5.3 (MU cascading sequence) or as described in 26.5.7 (NDP feedback report procedure). The TWT responding STA that intends to schedule for transmission additional Trigger frames during a trigger-enabled TWT SP shall set the More TF subfield in the Common Info field of the Trigger frame to 1 to indicate that it will schedule for transmission another Trigger frame within the same TWT SP. The TWT responding STA shall set the More TF subfield to 0 when the Trigger frame is the last scheduled Trigger frame of the TWT SP or when the Trigger frame is scheduled for transmission outside of a TWT SP.

NOTE 1—The TWT responding STA can cancel the transmission of a scheduled Trigger frame if the STA gains access to the wireless medium outside of the TWT SP. The TWT responding STA does not schedule for transmission a Trigger frame for the TWT requesting STA when the TWT agreement is not a trigger-enabled TWT agreement or when the TWT requesting STA has sent an OM Control subfield that has the UL MU Disable subfield equal to 1 (see 26.9 (Operating mode indication).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24441):***

NOTE 2—If the AP replaces the Trigger frame with a frame carrying a TRS Control field then the AP is recommended to allocate enough resources in subsequent Trigger frames sent during the TWT SP so that the STA can send as much as possible of the data reported in the BSR. *(#24441)* (#22277, #22278)

…

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24451, 24452):***

A TWT responding STA that receives a PS-Poll frame or a U-APSD trigger frame or any other indication from a TWT requesting STA that is in PS mode during or before a specific announced TWT SP but after the end of the most recent TWT SP preceding that specific TWT SP (if any), *(#24451, 24452)* that the TWT requesting STA is in the awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation during the CP) except that the TWT responding STA should deliver to the TWT requesting STA as many buffered BUs as are available at the TWT responding STA, provided that the BU delivery does not exceed the duration of the TWT SP, the TWT requesting STA has indicated that it is in the awake state for that TWT SP and as long as the TWT requesting STA has not entered the doze state (see 26.8.4.2 (TWT Information frame exchange for individual TWT) and 26.8.5 (Power save operation during TWT SPs)).

NOTE—The indication that the TWT requesting STA is in the awake state for that TWT SP might be a PS-Poll, U-APSD trigger frame, or any frame for which an immediate response is solicited and that follows the rules in 11.2.3.2 (Non-AP STA power management modes) but the corresponding immediate response frame is not received by the TWT requesting STA. Other indications that the STA is in the awake state are the transmission of an HE TB feedback NDP in response to an NFRP Trigger frame (see 26.5.7 (NDP feedback report procedure)) or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (Non-AP STA power management modes)).

…

* Rules for TWT scheduling AP

...

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24441):***

The TWT scheduling AP shall schedule for transmission of a Trigger frame addressed to one or more TWT scheduled STAs during a trigger-enabled TWT SP except that the Trigger frame may be replaced by a frame carrying a TRS Control subfield provided that the frame is carried in a DL MU PPDU and the AP allocates enough resources in the HE TB PPDU for the STA to at least deliver its BSRs in response to the soliciting DL MU PPDU.*(#24441)* A TWT scheduling AP should not include the 12 LSBs of the STA’s AID in a User Info field of a Trigger frame transmitted within a broadcast TWT SP unless the STA is in the awake state, has established membership in the broadcast TWT with that Broadcast TWT ID, or has indicated to receive the Beacon frame preceding the beacon interval that contains this TWT SP (see 26.8.6 (Negotiation of wake TBTT and wake interval)).

...

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24440, 24441):***

NOTE 3—If the AP replaces the Trigger frame with a frame carrying a TRS Control field then the AP is recommended to allocate enough resources in subsequent Trigger frames sent during the TWT SP so that the STA can send as much as possible of the data reported in the BSR. *(#24440, 24441)*

..…..

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24451, 24452):***

A TWT scheduling AP that receives a PS-Poll or a U-APSD trigger frame or any other indication from a TWT scheduled STA that is in PS mode during or before a specific announced TWT SP but after the end of the most recent TWT SP preceding that specific TWT SP (if any), *(#24451, 24452)* that the TWT scheduled STA is in the awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation) except that the AP should deliver to the TWT scheduled STA as many buffered BUs as are available at the AP, provided that the BU delivery does not exceed the duration of the TWT SP, the TWT scheduled STA has indicated that it is in the awake state for that TWT SP and as long as the TWT scheduled STA has not entered the doze state (see 26.8.4.3 (TWT Information frame exchange for broadcast TWT) and 26.8.5 (Power save operation during TWT SPs)).

…

* Rules for TWT scheduled STA

**…**

**TGax Editor: *Change the table below of this subclause as follows (#CID 24569):***

|  |
| --- |
| * Broadcast TWT membership exchanges
 |
| TWT Setup Command field in an initiating frame | TWT Setup Command field in a response frame | Condition after the completion of the exchange |
| Demand TWT | Accept TWT | A broadcast TWT schedule exists or has been created with the TWT parameters indicated in the initiating frame and repeated in the responding frame.The TWT scheduled STA transmitting the initiating frame is a member of the Broadcast TWT schedule identified by the Broadcast TWT ID and the TA of the response frame. |
| Request TWT or Suggest TWT | Accept TWT | A broadcast TWT schedule exists or has been created with the TWT parameters indicated in the response frame.The TWT scheduled STA transmitting the initiating frame is a member of the broadcast TWT schedule identified by the broadcast TWT ID and the TA of the response frame. |
| Suggest TWT or Demand TWT | Alternate TWT | No new broadcast TWT schedule has been created with the TWT parameters indicated in the initiating frame.The TWT scheduling AP is offering an alternative set of parameters vs. those indicated in the initiating frame, as a means of negotiating TWT parameters with the TWT scheduled STA.The TWT scheduled STA can send a new request with any set of TWT parameters and the TWT scheduling AP might create a new broadcast TWT schedule using the parameters indicated in the responding frame. |
| Suggest TWT or Demand TWT | Dictate TWT | No broadcast TWT schedule exists with the TWT parameters indicated in the initiating frame.The TWT scheduling AP offers an alternative set of parameters vs. those indicated in the initiating frame. The TWT scheduling AP indicates that it is not willing to accept any other TWT parameters from the TWT scheduled STA at this time.The TWT scheduled STA can send a new request, but will only receive an Accept TWT if it uses the dictated TWT parameters. *(#24569)* |
| Request TWT or Suggest TWT or Demand TWT | Reject TWT | The TWT scheduled STA transmitting the initiating frame is a not a member of a broadcast TWT identified by the broadcast TWT ID and the TA of the response frame, if such a broadcast TWT exists.The TWT scheduling AP will not accept any new request from the TWT scheduled STA to join or create a broadcast TWT at this time. |
| Accept TWT |  No frame transmitted | Not permitted to be transmitted by a TWT scheduled STA.When transmitted by a TWT scheduling AP, the recipient STA’s membership in the broadcast TWT schedule identified by the broadcast TWT ID and the TA of the initiating frame is established. |
| Alternate TWT or Dictate TWT | No frame transmitted | Not permitted to be transmitted by a TWT scheduled STA.When transmitted by a TWT scheduling AP, the TWT scheduled STA receiving this frame is not, through the receipt of this frame, a member of the broadcast TWT identified by the initiating frame.The TWT scheduled STA can use the information provided to create a request to join a TWT in a subsequent initiating frame that it transmits.  |
| Reject TWT | No frame transmitted | When transmitted by a TWT scheduled STA, the transmitting STA’s membership in the broadcast TWT schedule identified by the broadcast TWT ID and the RA of the initiating frame is terminated.When transmitted by a TWT scheduling AP, the receiving STA’s membership in the broadcast TWT schedule identified by the broadcast TWT ID and the TA of the initiating frame is terminated. |
| NOTE 1—The Negotiation Type subfield of the TWT element contained in these frames is 3.NOTE 2—The initiating frame and response frame settings not listed in the tables in 10.47 (Target wake time (TWT)) or 26.8 (TWT operation) are not allowed. The initiating frame is a TWT request if the TWT element contained in the frame has the TWT Request field equal to 1 (see Table 9-297 (TWT Setup Command field values)); otherwise it is a TWT response. The response frame is a TWT response.NOTE 3—In addition to these exchanges, the TWT scheduling AP might respond to an initiating frame that solicits membership in a broadcast TWT schedule with an indication or solicitation of the establishment of an individual TWT agreement.NOTE 4—MMPDUs that contain a broadcast TWT element generated by a TWT scheduled STA can be (Re)Association Request, and TWT Setup frames with TWT Request field equal to 1. The TWT element has the Negotiation Type subfield equal to 3 and the Broadcast TWT ID(s) that the STA intends to join or withdraw. MMPDUs that contain a broadcast TWT element generated by a TWT scheduled AP can be (Re)Association Response, and TWT Setup frames with TWT Request field equal to 0. The TWT element has the Negotiation Type subfield equal to 3 and the Broadcast TWT ID(s) to which the STA is assigned or from which the STA is withdrawn. |

...

* Power save operation during TWT SPs

...

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 24268, 24341, 24342, 24343):***

A TWT requesting STA or a TWT scheduled STA shall classify any of the following events as a TWT SP termination event:

* The transmission by the TWT requesting STA of an acknowledgment in response to an individually addressed QoS Data or QoS Null frame sent by the TWT responding STA that had the EOSP subfield equal to 1.*(#24341, 24342, 24343)*
1. The transmission by the TWT scheduled STA of an acknowledgment in response to an individually addressed QoS Data or QoS Null frame sent by the TWT scheduling AP that had the EOSP subfield equal to 1.*(#24341, 24342, 24343)*
* The transmission by the TWT requesting STA of an acknowledgment in response to an individually addressed frame that is neither a QoS Data frame nor a QoS Null frame, sent by the TWT responding STA with the More Data field equal to 0.*(#24341, 24342, 24343)*
* The transmission by the TWT scheduled STA of an acknowledgment in response to an individually addressed frame that is neither a QoS Data frame nor a QoS Null frame, sent by the TWT scheduling AP with the More Data field equal to 0.*(#24341, 24342, 24343)*
* The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent by the TWT responding STA or TWT scheduling AP, that does not solicit an immediate response and with the EOSP subfield equal to 1.
* The reception of an individually addressed frame that is neither a QoS Data frame nor a QoS Null frame, sent by the TWT responding STA or TWT scheduling AP, that does not solicit an immediate response and with the More Data field equal to 0.
* The reception of a Trigger frame sent by the TWT responding STA or TWT scheduling AP that has the More TF field equal to 0 and is not addressed to the TWT requesting STA or TWT scheduled STA provided that the TWT requesting STA or TWT scheduled STA is either awake for an announced trigger-enabled TWT SP but did not transmit an indication that it is in the awake state to the TWT responding STA or TWT scheduling AP or is awake for an unannounced trigger-enabled TWT SP.
1. The transmission/reception by the TWT requesting STA of the acknowledgment for a TWT Information frame that satisfies specific conditions that are defined in in 26.8.4.2 (TWT Information frame exchange for individual TWT) and in 26.8.4.4 (TWT Information frame exchange for flexible wake time).
2. The transmission/reception by the TWT scheduled STA of the acknowledgment for a TWT Information frame that satisfies specific conditions that are defined in 26.8.4.3 (TWT Information frame exchange for broadcast TWT) and in 26.8.4.4 (TWT Information frame exchange for flexible wake time). *(#24268)*

The classification of a More Data field equal to 0 in an Ack, BlockAck and individually addressed Multi-STA BlockAck frame as an event that terminates a TWT SP is only possible when both STAs have indicated support of transmitting or receiving the frame with a nonzero More Data subfield, which is indicated in the More Data Ack subfield of the QoS Info field of frames they transmit (see 11.2.3 (Power management in a non-DMG infrastructure network)).

NOTE 1—A STA participating in multiple TWT SPs that overlap in time stays in the awake state until the latest AdjustedMinimumTWTWakeDuration time of all of the TWT SPs expires, except that a TWT SP termination event causes all of the overlapping TWT SPs to terminate.

NOTE 2—A Trigger frame is addressed to the STA if the Trigger frame contains the AID of the STA in one of its User Info fields (see 26.5.2 (UL MU operation)), and has in its TA field either the MAC address of its associated AP or the transmitted BSSID (see 26.5.2.2.4 (Allowed settings of the Trigger frame fields and TRS Control subfield)). Otherwise, the Trigger frame is not addressed to the STA. If the Trigger frame contains one or more RA-RUs for which the STA can gain access according to 26.5.4 (UL OFDMA-based random access (UORA)) then the STA can follow the rules defined in 26.14.2 (Power save with UORA and TWT) to determine an early TWT SP termination event.

* *(#24268) (#24268)*HE subchannel selective transmission
* General

...

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24437):***

A non-AP HE STA(#22155) with dot11HESubchannelSelectiveTransmissionImplemented equal to true is a HE SST non-AP STA. *(#24437)* (#22150)

An HE AP with dot11HESubchannelSelectiveTransmissionImplemented equal to true is an HE SST AP. *(#24436, 24437)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24437):***

An HE SST non-AP STA and an HE SST AP may set up SST operation by negotiating a trigger-enabled TWT as defined in 26.8.2 (Individual TWT agreements) except that:*(#24436, 24437)*

* The TWT request may have a TWT Channel field with up to one bit set to 1 to indicate the secondary channel requested to contain the RU allocations addressed to the HE SST non-AP STA(#22150) that is a 20 MHz operating STA
* The TWT request may have a TWT Channel field with all the four LSBs or all the four MSBs set to 1 to indicate whether the primary 80 MHz channel or the secondary 80 MHz channel is requested to contain the RU allocations addressed to the HE SST non-AP STA(#22150) that is an 80 MHz operating STA
* The TWT response shall have a TWT Channel field with up to one bit set to 1 to indicate the secondary channel that will contain the RU allocations addressed to the HE SST non-AP STA(#22150) that is a 20 MHz operating STA
* The TWT response shall have a TWT Channel field with all the 4 LSBs or all the 4 MSBs to indicate whether the primary 80 MHz channel or the secondary 80 MHz channel will contain the RU allocations addressed to the HE SST non-AP STA(#22150) that is a 80 MHz operating STA.
* SST operation

An HE SST non-AP STA(#22150) and HE SST AP that successfully sets up SST operation shall follow the rules defined in this subclause.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 24437, 24104):***

If an HE SST AP causes its operating channel or channel width to change and if any(#22151) secondary channel of a trigger-enabled TWT(#22231) is not within the new operating channel or channel width, then the HE SST AP and the HE SST non-AP STA implicitly terminate the trigger-enabled TWT(#22231).*(#24436, 24437)* (#Ed)(#22147, #22153)

The HE SST AP follows the rules in 26.8.2 (Individual TWT agreements) to exchange frames with the HE SST non-AP STA(#22150) during trigger-enabled TWT SPs(#22231), except that the AP shall ensure the following:(#Ed)

* The individually addressed RUs allocated in DL MU PPDUs and in Trigger frames addressed to the HE SST non-AP STA(#22150) are within the subchannel indicated in the TWT Channel field of the TWT response and follows the RU restriction rules defined in 27.3.2.8 (RU restrictions for 20 MHz operation) if the HE SST non-AP STA is a 20 MHz operating STA and in 27.3.2.9 (80 MHz operating non-AP HE STAs) if the HE SST non-AP STA(#22150) is an 80 MHz operating STA.*(#24436, 24437)*
* The TXVECTOR parameter CH\_BANDWIDTH of a DL MU PPDU is not set to HE-CBW-PUNC160-PRI20, HE-CBW-PUNC80+80-PRI20, HE-CBW-PUNC160-SEC40 or HE-CBW-PUNC80+80-SEC40 if the DL MU PPDU is addressed to at least one HE SST non-AP STA that is an 80 MHz operating STA operating in a secondary channel. *(#24104)*
* The trigger-enabled TWT SPs do not overlap with TBTTs at which DTIM Beacon frames are sent.
* The same subchannel is used for all trigger-enabled TWT SPs with the same HE SST non-AP STA(#22150) that overlap in time.

An HE SST non-AP STA(#22150) operating on the secondary channel shall not conduct OMI operation as defined in 26.9 (Operating mode indication) or OMN operation as defined in 11.41 (Notification of operating mode changes) to change the operating bandwidth.

The HE SST non-AP STA(#22150) follows the rules in 26.8.2 (Individual TWT agreements) to exchange frames with the HE SST AP during trigger-enabled TWT SPs(#22231), except that the STA:

* Shall be available in the subchannel indicated in the TWT Channel field of the TWT response at TWT start times
* Shall not access the medium in the subchannel using DCF or EDCAF
* Shall not respond to Trigger frames addressed to it (see 26.5 (MU operation) and 26.8.2 (Individual TWT agreements)) unless it has performed CCA until a frame is detected by which it can set its NAV, or until a period equal to NAVSyncDelay has transpired, whichever is earlier.
* Shall update its NAV according to 26.2.4 (Updating two NAVs) if it receives a PPDU in the subchannel

An HE SST non-AP STA(#22150) may include a Channel Switch Timing element in (Re-)Association Request frames it transmits to an HE SST AP to indicate the time required by the STA to switch between different subchannels. The received channel switch time informs the HE SST AP of the duration of time that the HE SST non-AP STA(#22150) might not be available to receive frames before the TWT start time and after the end of the trigger-enabled TWT SP.

NOTE—An HE SST non-AP STA in PS mode is not required to move to the primary channel after the end of the trigger-enabled TWT SP. *(#24436, 24437)*

**9.2.4.6a.2 OM Control**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24437):***

The Channel Width subfield indicates the operating channel width supported by the STA for both reception and transmission. It is set to 0 for 20 MHz, 1 for primary 40 MHz, 2 for primary 80 MHz, and 3 for 160 MHz and 80+80 MHz. The value 0 indicates a primary 20 MHz, unless the STA has negotiated SST operation in which case it indicates any of the negotiated 20 MHz subchannels of the SST operation (see 26.8.7 (HE subchannel selective transmission)). *(#24436, 24437)*

**26.15.7 Additional rules for group addressed frames in an HE MU PPDU**

**TGax Editor: *Change the bullet below of this subclause as follows (#CID 24437):***

* The SST subchannel if the group addressed frame is addressed to one or more HE SST non-AP STAs, the primary 20 MHz channel does not coincide with the subchannel assigned to the HE SST non-AP STAs and the frame is not addressed to any STAs other than the HE SST non-AP STAs in that subchannel (see 26.8.7.2 (SST operation)). The broadcast RU size shall not exceed 106 subcarriers if the SST subchannel is 20 MHz.*(#24436, 24437)*

**10.47.1 TWT overview**

**TGax Editor: *Change the row below of this table as follows (#CID 24569):***

**Table 10-31a—TWT setup exchange command interpretation**

|  |  |  |
| --- | --- | --- |
| Demand TWT or SuggestTWT | Dictate TWT | No individual TWT agreement exists with the associated TWT flow identifier. The responder STA offers an alternative set of parameters vs. those indicated in the initiating frame. The responder STA indicates that it is not willing to accept any other TWT parameters from 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. *(#24569)* |

**9.4.2.199 TWT element**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 24548):***

The Flow Type subfield indicates the type of interaction between the TWT requesting STA and the TWT responding STA at a TWT. Setting the Flow Type subfield to 0 indicates an announced TWT in which the TWT requesting STA will send a PS-Poll or an APSD trigger frame (see 11.2.3.5 (Power management with APSD)) to signal its awake state to the TWT responding STA before a frame is sent from the TWT responding STA to the TWT requesting STA. A TWT SP that is set up under an announced TWT agreement is an announced TWT SP. Setting the Flow Type subfield to 1 indicates an unannounced TWT in which the TWT responding STA will send a frame to the TWT requesting STA at TWT without waiting to receive a PS-Poll or an APSD trigger frame from the TWT requesting STA. A TWT SP that is set up under an unannounced TWT agreement is an unannounced TWT SP.*(#24548)*