IEEE P802.11
Wireless LANs

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| Comment resolutions for TWT Information frames |
| Date: 2019-05-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D4.0 with the following CIDs (24 CIDs):

* 20333, 20334, 20335, 20359, 20361, 20402, 20403, 20404, 20405, 20408,
* 21087, 21088, 21089, 21090, 21091, 21092, 21093, 21170, 20353, 20354,
* 20355, 20356, 20357, 20358, 20838

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised version takes in account the proposed changes that were suggested during the presentation at the ad-hoc meeting. As of this revision the CID 20405 is still deferred and CIDs 20404 (is kept as is) and CID 20354 and related CIDs are updated. Changes are highlighted in green.
* Rev 2: Incorporates changes proposed during the presentation and proposed by Jarkko. Changes in this color.

Interpretation of a Motion to Adopt

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

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

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

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 20333 | kaiying Lv | 380.34 | Change "the Next TWT" to "the Next TWT subfield" | As in comment. | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested change, applying it throughout the subclause. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20333. |
| 20334 | kaiying Lv | 382.56 | Change "the next TWT information" to "the Next TWT field of the TWT information". | As in comment. | Revised –Agree with the comment. Proposed resolution accounts for the suggested change, with editorial improvements (the TWT Information frame). TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20334. |
| 20335 | kaiying Lv | 382.64 | change to "the TWTs are resumed or suspended" | As in comment. | Rejected –This subclause describes the Flexible TWT case, which is achieved by sending a TWT Information frame that contains a flexible TWT (i.e., a next TWT subfield). The suspension is achieved by sending a TWT Information frame that does not contain a Next TWT subfields and is covered extensively in the previous subclauses.  |
| 20359 | Laurent Cariou | 382.41 | Flexible TWT can be used if the STA does not have a TWT agreement with the AP. This function is therefore much wider than just TWT. For clarity, it would be much better not to call this functionality Flexible TWT, but something like Flexible Power state indication | Rename the Flexible TWT functionality, by something more generic, such as Flexible Power State Indication | Revised –The current naming is appropriate. The STA that transmits the frame has flexibility in terms of the target wake time that it plans to wake, but does not have flexibility in terms of the power state since the PM mode is preserved from the time the TWT Information frame is sent to the time indicated in the Next TWT subfield of the TWT Information frame. Proposed resolution is to replace in the subclause title TWT with “wake time”.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20359. |
| 20361 | Laurent Cariou | 382.43 | Flexible TWT can be used if the STA does not have a TWT agreement with the AP. This function is therefore much wider than just TWT and applies to any legacy power save mechanism. This should be better clarified in this section. This section should also reference the different section describing the legacy power save mechnaims that are impacted by this flexible TWT. | Clarify the use of flexible TWT without TWT agreements and the impact on legacy power save mechanisms. | Revised –Agree in principle with the comment. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20361. |
| 20402 | Liwen Chu | 380.29 | The baseline never uses this field. IT seems duplicated with Next TWT Request field | Use Next TWT Request field here | Rejected –It is unclear what field the baseline never uses. The cited line has the following fields: Response Requested and the Next TWT Request subfields, which are defined in 9.4.1.60 and are used to request the delivery of a TWT Information frame in response to the soliciting TWT Information frame (with Next TWT required or not). Since 11ax is not using those combinations then the specific text here is indicating that the TWT Infromation frame shall have both these fields set to 0.  |
| 20403 | Liwen Chu | 380.60 | by TWT Responding STA, scheduling STA is missing. | Technical | Rejected –This bullet is covering the TWT suspension case, which can be only initiated by a TWT requesting STA or a TWT scheduled STA. I.e., a TWT responding STA and a TWT scheduling AP can only reschedule a TWT but not suspend it. An AP that needs to deal with coexistence can use the suspend and resume command. Reason being that it is beneficial for the STA to know when the AP will be again available for frame exchanges.  |
| 20404 | Liwen Chu | 381.40 | based on this, it doesn't matter whether the next TWT is a existed TWT SP start time. |  | Rejected –It is unclear what is the part that does not matter. According to the functionality the STA can ask suspension and resumption of the TWT session for that particular TWT Flow ID (as indicated in the TWT Information frame, with the requirement that the next TWT is selected from existing TWTs for that session. Now in case the STA sets the All TWT subfield to 1 then the STA is also suspending or resuming the other sessions as well but starting from their respective TWTs that start not earlier than the time indicated in the Next TWT. |
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| 20408 | Liwen Chu | 380.33 | It is not clear when "by any HE STA to a peer STA that supports TWT" is used | Clarify it. | Revised –Agree in principle with the comment that it is not clear. Proposed resolution specifies it to be the STA that has set the Flexible TWT Schedule Support field to 1 in the HE Capabilities element it transmits.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20408. |
| 21087 | Matthew Fischer | 381.32 | The second sub-bullet also seems to be describing a suspend. It should state this, otherwise, there is no suspend occurring, or worse, neither side knows what the other is doing. There is no such thing as "resume" if there was never a "suspend" | Change "shall resume" to "considers the corresponding TWT session suspended and shall resume" | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested change. Also proposed to use consistently throughout the subclause TWT agreement rather than session and removed an inconsistent bullet which describes the contents of the Next TWT subfield when the next twt subfield is not present. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21087. |
| 21088 | Matthew Fischer | 381.22 | Technically, per 10.43.4, it is not the receipt of a TWT Information frame, but the receipt of a Next TWT field. And importantly, a TWT Info frame can be received that has no Next TWT field. | Change "that receives a TWT Information frame" to "that receives a frame containing a Next TWT field" | Revised –Agree in principle with the comment. But the frame is a TWT Information frame since in 11ax we do not use STACK, BAT, and TACK frames. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21088. |
| 21089 | Matthew Fischer | 381.12 | The heading is incorrect - because we are talking about a frame, the phrase "TWT information" is the name of that frame, and therefore, it should be capitalized. | Change the heading name from "TWT information for individual TWT" to TWT Information frame exchange for individual TWT", make a similar change for the broadcast TWT heading at 26.8.4.3 and flexible TWT at 26.8.4.4 | Revised –Agree in principle with the comment. Accounted for the suggested changes.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21089. |
| 21090 | Matthew Fischer | 381.52 | The first part of the sentence mentions peer STA, but then it explicitly says AP later in the same sentence, which is narrowing the scope. | Fix the scope inconsistency | Revised –Agree in principle with the comment. Proposed resolution fixes the inconsistency by replacing peer STA with TWT responding STA and AP with TWT responding STA. Applied similar changes to the subsequent subclause as well.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21090. |
| 21091 | Matthew Fischer | 381.49 | Again, here it says the STA may enter doze and then mentions that the STA resumes TWT later, without first saying that TWT is suspended. This is technically lacking and ambiguously equates transition to DOZE with suspension of TWT, which is simply not true, as a STA in DOZE can wake for the next TWT SP. If the STA is not going to be waking for some TWT SP that it is otherwise expected to wake for, then that needs to be clearly stated in the specification. | Fix the problem identified by explicitly stating that the STA suspends the TWT sesssion. If the word suspend is not liked, then find some other word, but make the action of the STA explicit and unambiguously predictable. | Revised –Agree in principle with the comment. Proposed resolution clears the ambiguity by specifying that the TWT session is suspended and then resumed as per suggestion.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21091. |
| 21092 | Matthew Fischer | 382.06 | Another instance of resume with a previous suspend, although note that the paragraph after this one did do it correctly, proving that it can be done! | Fix the problem identified by explicitly stating that the STA suspends the TWT sesssion. If the word suspend is not liked, then find some other word, but make the action of the STA explicit and unambiguously predictable. Also fix P382L18, and in the paragraph at P382L29 | Revised –Agree in principle with the comment. Proposed resolution clears the ambiguity by specifying that the TWT session is suspended and then resumed as per suggestion. Also clarified that these are TWT schedules rather than TWT sessions to keep consistency throughout. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21092. |
| 21093 | Matthew Fischer | 382.61 | What is supposed to be accomplished by preserving the PM mode? A STA with PM=1 can still make transitions between DOZE and AWAKE. Is such a STA expected to transition to AWAKE for the very next TWT SP as originally scheduled, not the one named in the Next TWT field? What really is the behavior of the STA that exchanges this frame if PM=1? For PM==0, it makes sense, as this exchange becomes a promise to remain in the AWAKE state. Although the suggested PM==0 behavior contradicts the subsequent paragraph, although maybe unintentionally as there is some redundancy between the conditions of the contents of the TWT Info frames of the two paragraphs which was probably not intended and if removed could resolve some of the contradiction. | Clarify with explicit detail just exactly what the STA will do after this exchange, especially for the PM==1 case. | Revised –Agree in principle with the comment. Proposed resolution adds additional details for this case. For PM = 1 the STA goes to doze state and then wakes up at the time specified in the Next TWT and at that time it follows the power save protocol that it is using, since the PM mode is the same as the one it left when transitioning to the doze state. Similar considerations are provided for the case of active mode (PM = 0) and additionally provided more details for the baseline subclauses that are followed by the STA.TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 21093. |
| 21170 | Pooya Monajemi | 380.25 | When a broadcast TWT schedule needs to be suspended or resumed for every participating STA, the AP is required to send individual TWT Information frame addressed to each STA. This can be very inefficient when large number of STAs are involved. Spec should allow TWT Information frame to be broadcast when the schedule change affects all participants. DL MU is still very inefficient in a BSS with a large STA count (think 100 or more), therefore this note does not address the problem. | As in comment |  Rejected –The problem with sending TWT information frames that are broadcast is that there is no guarantee that all the STAs receive the frame, as such those STAs that fail to receive the suspension command will continue to wake up and burn power. Please note that the AP can always send multiple DL MU PPDUs each of which has multiple RUs (up to 9 if 20 MHz, 18 if 40 MHz and so on), wherein each RU contains a TWT information frame for each STA. |
| 20353 | Laurent Cariou | 2149.28 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. This indication to doze has to be considered in other power save mechanisms, including APSD. | Clarify in 11.2.3.5.1 that the TWT Info frame exchange with Flexible TWT is a condition that allows a STA to go to doze state with APSD. | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20353. |
| 20354 | Laurent Cariou | 2153.20 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. In sections describing legacy power save mechanisms, a condition is missing to clarify that sending such frames are a condition to transition to doze state.. | Clarify this behavior in 11.2.3.6 | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20354. |
| 20355 | Laurent Cariou | 2157.07 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. In sections describing legacy power save mechanisms, a condition is missing to clarify that sending such frames are a condition to transition to doze state.. | Clarify this behavior in 11.2.3.7 | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20355. |
| 20356 | Laurent Cariou | 2158.07 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. In sections describing legacy power save mechanisms, a condition is missing to clarify that sending such frames are a condition to transition to doze state.. | Clarify this behavior in 11.2.3.8 | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20356. |
| 20357 | Laurent Cariou | 2159.24 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. In sections describing legacy power save mechanisms, a condition is missing to clarify that sending such frames are a condition to transition to doze state.. | Clarify this behavior in 11.2.3.12 | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20357. |
| 20358 | Laurent Cariou | 2177.12 | Flexible TWT allows a PS STA that is Flexible TWT capable to indicate that it goes to doze state until a point in time, even if the STA does not have a TWT agreement with an AP that is also Fexible TWT capable. In sections describing legacy power save mechanisms, a condition is missing to clarify that sending such frames are a condition to transition to doze state.. | Clarify this behavior in 11.2.4.4 | Revised –Agree in principle with the comment, although not with the proposed change. Proposed resolution is to follow the new editorial style guide where the instruction is to explicitly call baseline subclauses and then add the explicit exemptions that apply due to the new behavior. In this case we mention subclasue 11.2.3.6 as the rule set that the STA follows depending on the power management mode. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20358. |
| 20838 | Mark RISON |  | For TWT, sometimes it's schedule, sometimes session, sometimes agreement -- should be consistent. Also it's inconsistent between individual and broadcast TWT | As it says in the comment | Revised –Agree in principle with the comment. Proposed resolution replaces session with “agreement” or “schedule” as appropriate. TGax editor to make the changes shown in 11-19/0652r2 under all headings that include CID 20838. |

**Discussion: *None.***

* Use of TWT Information frames
* General

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21087, 21092, 20838):***

An HE STA may transmit a TWT Information frame to its peer STA during an individual TWT agreement*(#21087)*, broadcast TWT schedule*(#21092, 20838)*, or at any time as defined in 26.8.4.2 (TWT information for individual TWT), 26.8.4.3 (TWT information for broadcast TWT) and 26.8.4.4 (TWT information for flexible TWT), respectively.

NOTE—An HE AP might include multiple TWT Information frames, each addressed to a different peer STA, in an HE MU PPDU (see 26.5.1 (HE DL MU operation)).(#15102)

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20333, 21087, 21092, 20838):***

The TWT Information frame shall have the Response Requested subfield equal to 0, the Next TWT Request subfield equal to 0, and one of the following:

* A nonzero value in the Next TWT subfield when the frame is transmitted by a TWT responding STA, a TWT scheduling AP, or when the frame is transmitted by an HE STA to a peer STA that has set the Flexible TWT Schedule Support field to 1 in the HE Capabilities element it transmits.*(#20408)*
* The value of the Next TWT subfield*(#20333)* shall be selected from existing TWT values for an individual TWT agreement if the Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 0 and shall be selected from existing TWT values for a broadcast TWT schedule regardless of the value of the Flexible TWT Schedule Support field received from the peer STA.
* The Next TWT subfield*(#20333)* may contain any nonzero value if Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 1.
* The All TWT field is 1 if the resumption applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT responding STA.(#16427)
* A Next TWT subfield that is present when the frame is transmitted by a TWT requesting STA, a TWT scheduled STA, or when the frame is transmitted by any HE STA to a peer STA that has set the Flexible TWT Schedule Support field to 1 in the HE Capabilities element it transmits.*(#20408)*
* The Next TWT subfield*(#20333)* indicates the earliest TWT at which the individual TWT agreement or broadcast TWT schedule is resumed and shall be selected from existing TWT values for that TWT agreement or broadcast TWT schedule*(#21087, 21092, 20838)* if the Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 0.
* The All TWT field is 1 if the resumption applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT requesting STA.(#16427)
* The Next TWT subfield*(#20333)* may contain any nonzero value if Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 1.
* A Next TWT subfield that is not present when the frame is transmitted by a TWT requesting STA or a TWT scheduled STA to indicate suspension of the individual TWT agreement or broadcast TWT schedule.*(#21087, 21092, 20838)*
* The All TWT subfield is 1 if the suspension applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT requesting STA.(#16427)
* *(#21087)*

The use of TWT Information frames for suspending and/or resuming existing individual TWT agreements is described in 26.8.4.2 (TWT information for individual TWT). The use of TWT Information frames for suspending and/or resuming existing broadcast TWT schedules is described in 26.8.4.3 (TWT information for broadcast TWT). The use of TWT Information frames for providing a flexible TWT that is independent of any existing TWT agreements or TWT schedules is described in 26.8.4.4 (TWT information for flexible TWT).*(#21087, 21092, 20838)* (#16428)

**TGax Editor: *Change the heading of this subclause as follows (#CID 21089):***

* TWT Information frame exchange for individual TWT*(#21089)*

An HE STA that has an individual TWT agreement may transmit a TWT Information frame to a peer STA with which it has the agreement if the peer STA has set the TWT Information Frame Disabled field to 0 in the TWT element sent during TWT setup; otherwise the HE STA shall not transmit a TWT Information frame to the peer STA. The HE STA sets the fields of the TWT Information frame as defined in 26.8.4.1 (General).

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21088):***

A TWT requesting STA that receives a TWT Information frame containing a Next TWT subfield follows the rules defined in 10.43.4 (Implicit TWT operation).*(#21088)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20333, 21087, 20838):***

A TWT requesting STA that receives an acknowledgment in response to a transmitted TWT Information frame that:

* Does not contain a Next TWT subfield*(#20333)* shall consider the corresponding TWT agreement suspended, and can follow other individual TWT agreements, the procedure in 26.8.3 (Broadcast TWT operation), or the default PS procedure defined in 11.2 (Power management) until the TWT agreement is resumed*(#20838)*.
* Contains a Next TWT subfield*(#20333)* shall consider the corresponding TWT agreement suspended and shall resume the TWT agreement*(#21087, 20838)* starting from the value indicated in the Next TWT subfield*(#20333)* of the transmitted TWT Information frame.

NOTE—The TWT Flow Identifier, together with the MAC addresses of the TWT requesting STA and TWT Responding STA identifies the TWT agreement for which the TWT Information frame is sent (see 10.48.1 (TWT overview)).

If the TWT Information frame contains an All TWT subfield equal to 1 then the above rules apply to all individual TWT agreements, except that the resumptions of the respective TWTs shall occur at the first TWT of the respective TWT agreement that occurs not earlier than the Next TWT value contained in the TWT Information frame, regardless of the value of the Flexible TWT Schedule Support field in the HE Capabilities element exchanged between the two STAs.*(#21087, 20838)* (#16425)

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21091, 21090, 20838):***

A TWT requesting STA that is in PS mode and that transmits a TWT Information frame to a TWT responding STA shall suspend the corresponding TWT agreement and may transition to doze state after receiving the acknowledgment even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT responding STA in response, and shall resume TWT operation for the corresponding TWT agreement at the specified TWT indicated (if any) in the TWT Information frame. A TWT requesting STA that is in PS mode and that receives a TWT Information frame from a TWT responding STA shall suspend the TWT agreement and may go to doze state after transmitting the acknowledgment even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT responding STA in response and shall resume TWT operation for the corresponding TWT agreement at the specified TWT indicated (if any) in the TWT Information frame.*(#21090, 21091, 20838)*

**TGax Editor: *Change the heading of this subclause as follows (#CID 21089):***

* TWT Information frame exchange for broadcast TWT*(#21089)*

An HE STA that is a TWT scheduling AP may transmit a TWT Information frame to any of the members of a broadcast TWT schedule if the member has set the TWT Information Frame Disabled field to 0 in the TWT element sent when joining the broadcast TWT schedule. An HE STA that is a TWT scheduled STA may transmit a TWT Information frame to the TWT scheduling AP corresponding to a broadcast TWT schedule established by that STA if the AP has set the TWT Information Frame Disabled field to 0 in the broadcast TWT element it transmits. The HE STA sets the fields of the TWT Information frame as defined in 26.8.4.1 (General).

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21092, 20333, 20838):***

A TWT scheduled STA that receives a TWT Information frame that contains an All TWT subfield equal to 1 follows the rules defined in 26.8.3.3 (Rules for TWT scheduled STA), except that the TWT scheduled STA shall consider all the broadcast TWT schedules suspended until the broadcast TWT schedules areresumed at their corresponding broadcast TWTs*(#21092)*, which occur not earlier than the Next TWT value contained in the received TWT Information frame.

A TWT scheduled STA that receives an acknowledgment in response to a transmitted TWT Information frame that contains an All TWT subfield equal to 1 and that does not contain a Next TWT subfield*(#20333)*, shall consider all broadcast TWT schedules suspended, and can follow the default PS procedure defined in 11.2 (Power management) until the broadcast TWT schedules are resumed*(#21092, 20838)*.

A TWT scheduled STA that receives an acknowledgment in response to a transmitted TWT Information frame that contains an All TWT subfield equal to 1 and that contains a Next TWT subfield*(#20333)*, shall suspend all broadcast TWT schedules and shall resume*(#21092)* the broadcast TWT schedules at the first scheduled TWT for each respective broadcast TWT schedule that occurs not earlier than the value indicated in the Next TWT subfield*(#20333)* contained in the transmitted TWT Information frame, regardless of the values of the Flexible TWT Schedule Support field in the HE Capabilities element exchanged between the two STAs.(#16426)

NOTE—TWT suspension and resumption as indicated by a TWT Information frame with the All TWT subfield equal to 1 applies to all broadcast TWT schedules of the TWT scheduling AP. *(#21092, 203838)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21092, 22090, 20838):***

A TWT scheduled STA that is in PS mode and that transmits a TWT Information frame to a TWT scheduling AP shall suspend the corresponding broadcast TWT schedule and may transition to doze state after receiving the acknowledgment, even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT scheduling AP in response, and shall resume*(#21092)* TWT operation for the corresponding broadcast TWT schedule at the specified TWT indicated (if any) in the TWT Information frame. A TWT scheduled STA that is in PS mode and that receives a TWT Information frame from a TWT scheduling AP shall suspend the corresponding broadcast TWT schedule and may transition to doze state after transmitting the acknowledgment, even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT scheduling AP in response, and shall resume TWT operation for the corresponding broadcast TWT schedule at the specified TWT indicated (if any) in the TWT Information frame.*(#21090, 20838)*

**TGax Editor: *Change the heading of this subclause as follows (#CID 21089, 20359):***

* TWT Information frame exchange for flexible wake time*(#21089, 20359)*

An HE STA may transmit a TWT Information frame that contains a flexible TWT to a peer STA if the peer STA has set the Flexible TWT Schedule Support field of the HE Capabilities it transmits to 1; otherwise the HE STA shall not transmit a TWT Information frame that contains a flexible TWT to the peer STA.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20333, 20334, 21092, 20838, 20354):***

A flexible TWT is a nonzero value indicated in the Next TWT subfield*(#20333)* of a TWT Information frame with All TWT subfield equal to 0, which is independent from any existing TWT values of TWT agreements*(#21092, 20838)* that the HE STA might be following (if any). The HE STA sets the fields of the transmitted TWT Information frame as defined in 26.8.4.1 (General).

NOTE—Flexible TWT support does not depend on the STA’s TWT capabilities, i.e., the STA can use flexible TWT without being required to set up an individual TWT agreement or broadcast TWT schedule.*(#20354)*

An HE STA that successfully exchanges a TWT Information frame with flexible TWT and that contains a TWT Flow Identifier that identifies an existing individual TWT agreement shall replace the next TWT SP start time for that individual TWT agreement with the value contained in the Next TWT subfield of the TWT Information frame*(#20334)*.

**TGax Editor: *Change the paragraphs below as follows (#CID 21092, 20333, 21093, 20353-20358, 20361):***

An HE non-AP STA that successfully exchanges a TWT Information frame with flexible TWT and that contains a TWT Flow Identifier that does not identify any existing individual TWT agreement preserves the PM mode from the time the TWT Information frame was sent to the time indicated in the Next TWT subfield*(#20333)* of the TWT Information frame as described below.

NOTE—When the TWT Information frame has the All TWT field equal to 1 then the TWTs are suspended and resumed*(#21092)* as described in 26.8.4.2 (TWT information for individual TWT) and 26.8.4.3 (TWT information for broadcast TWT).

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21093, 20353-20358, 20361):***

A non-AP HE STA that transmits a TWT Information frame that contains a flexible TWT to a peer STA may go to doze state after receiving the acknowledgment if it is in PS mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 1) and may be unavailable if it is in active mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 0) and shall be in the awake state at the time it indicated in the Next TWT field of the TWT Information frame and shall be in the PS mode if the PM subfield of the TWT Information frame was 1 and in active mode if the PM subfield of the TWT Information frame was 0. The STA, once in the awake state, shall follow the rules that correspond to the power management mode of the STA, which are defined in in 11.2.3 (Power management in a non-DMG infrastructure network) for the Active and PS mode, and in 26.8 (TWT operation) when the STA operates within TWT SPs.(#16428)

NOTE—An HE AP delivers DL BUs to the STA at or after the flexible TWT indicated in the flexible TWT by following the rules in 11.2.3.6 (AP operation) if the STA does not follow TWT, and by following the rules in 26.8 (TWT operation) if the STA follows TWT and the delivery falls within a TWT SP. The STA is not required to send a frame at or after the flexible TWT to indicate its awake state to the AP. If the STA is following U-APSD then the operation is resumed at a time that occurs at the flexible TWT and if the STA is following an APSD schedule then the operation is resumed at a time that occurs at or after the flexible TWT.*(#21093, 20354)*

A non-AP HE STA that receives a TWT Information frame that contains a flexible TWT from a peer STA may go to doze state after transmitting the acknowledgment if it is in PS mode and may be unavailable if it is in active mode and shall be in the awake state at the time it indicated in the Next TWT field of the TWT Information frame and shall be in the PS mode if the STA was in PS mode when it received the TWT Information frame and in active mode if the STA was in active mode when it received the TWT Information frame. The STA, once in the awake state, shall follow the rules that correspond to the power management mode of the STA, which are defined in in 11.2.3 (Power management in a non-DMG infrastructure network) for the Active and PS mode, and in 26.8 (TWT operation) when the STA operates within TWT SPs.

(#16428)

*(#21093, 20353-20358, 20361)*