### IEEE P802.11Wireless LANs

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| 11ba D1.1 MAC Comment Resolution for WUR Duty Cycle Part I |
| Date: 2018-11-11 |
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Abstract

This submission proposes resolutions for comments of TGba Draft D1.0 with the following CIDs:

308, 792, 68, 72, 73, 365, 699, 703, 877, 985, 994, 1000, 1092, 1229, 535, 115, 169, 1156, 529, 530, 531, 532, 856, 857, 534, 44, 533, 724, 112, 405, 1131, 113, 110, 406, 111, 114, 116, 342, 343, 429, 603, 725, 887, 1241, 1001, 1002, 1130,

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGba D1.1 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba D1.1 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

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

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 308 | Hanseul Hong | 30.07 | 9.4.2.273 | The duty cycle period is only included in the WUR mode element sent by STA. For duty cycle scheduling and transmission of broadcast WUR Wake-up frame, AP should be able to indicate the preferred duty cycle period | Include the Duty Cycle Period in the WUR Parameters field from WUR AP | Rejected – Current spec already provides a mechnaims for AP to regulate the duty cycle and enable transmission of broadcast WUR Wake-up frame. Specifically, AP can deicde the duty cycle period unit and the starting time of the duty cycle.If AP decides the Duty cycle period, it may not match the delay requirement of the non-STA. |
| 792 | Osama Aboulmagd | 52.17 | 31.5 | What is the impact of the WUR duty cycle on the delay experienced by frames destined to a WUR non-AP STA in the off-duration? Some discussion is needed. | as in comment | Rejected – WUR non-AP STA determines the duty cycle period in the negotiation to match its delay constraint.  |
| 68 | Alfred Asterjadhi | 31.51 | 9.4.2.273 | Duty cycle period use here is confusing. DC is a fraction of active time within a period. I think here you want to simply indicate the periodicity of the WUR Wake Times. Also please provide unit. As in comment. | As in comment. | Revised – Agree in principle with the commeter. We note that based on Wikipedia definition, we have the following. As a result, Duty Cycle period is the right name. *A duty cycle is the fraction of one*[*period*](https://en.wikipedia.org/wiki/Frequency)*in which a signal or system is active. Duty cycle is commonly expressed as a percentage or a ratio. A period is the time it takes for a signal to complete an on-and-off*[*cycle*](https://en.wikipedia.org/wiki/Turn_%28geometry%29)*.*We move the description of unit from the definition box to the encoding box. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 68. |
| 72 | Alfred Asterjadhi | 34.31 | 9.4.2.275 | On Duration term is odd. Suggest using Service Period. I.e., minimum WUR service period (SP) in this case. | As in comment. | Rejected – We note that based on Wikipedia definition, we have the following. As a result, “on Duration” is a proper name. *A duty cycle is the fraction of one*[*period*](https://en.wikipedia.org/wiki/Frequency)*in which a signal or system is active. Duty cycle is commonly expressed as a percentage or a ratio. A period is the time it takes for a signal to complete an on-and-off*[*cycle*](https://en.wikipedia.org/wiki/Turn_%28geometry%29)*.* |
| 73 | Alfred Asterjadhi | 34.36 | 9.4.2.275 | Granularity versus unit. I think unit wins. | As in comment. | Accepted -  |
| 365 | James Lepp | 31.51 | 9.4.2.273 | In table 9-318e the unit is shown in the Encoding column for the On Duration, but the unit is not shown in the Encoding column for the Duty Cycle Period. |  | Revised – Agree in principle with the commeter.We move the description of unit from the definition box to the encoding box. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 68. |
| 699 | Minyoung Park | 30.26 | 9.4.2.273 | The name of the subfield "Starting Time Of The WUR Duty Cycle" is too long and is hard to repeat every time we have to describe in the spec. Either shorten it or use abbreviation. | Change the subfield name from "Starting Time Of The WUR Duty Cycle" to "Duty Cycle Start Time" and make changes to other occurances in the draft. | Revised – Agree in principle with the commeter.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 699. |
| 703 | Minyoung Park | 31.43 | 9.4.2.273 | In this subclause a normative behavior should not be defined. Please rephase the following sentence to remove "will": "Indicates the preferred On Duration that the WURx of the WUR non-AP STA will be in WURx awake state for each the WUR duty cycle schedule (see 31.5 (WUR duty cycle operation))." | Replace P31L43:"Indicates the preferred On Duration that the WURx of the WUR non-AP STA will be in WURx awake state for each the WUR duty cycle schedule (see 31.5 (WUR duty cycle operation))"as follows:"Indicates the preferred time duration that the WURx of the WUR non-AP STA is in the WURx awake state for each the WUR duty cycle schedule (see 31.5 (WUR duty cycle operation))." | Accetped – |
| 877 | Rojan Chitrakar | 31.44 | 9.4.2.273 | Since On Duration is defined as WUR duty cycle schedule in 31.5, the definition of ON Duration here is not correct. | Change the defintion to:"Indicates the preferred On Duration that the WURx of the WUR non-AP STA will be in WURx awake state during each Duty Cycle Period (see 31.5 (WUR duty cycle operation))." | Accetped - |
| 985 | Sung Hyun Hwang | 30.26 | 9.4.2.273 | Synchronization of multiple WUR Duty Cycles can be an issue. A procedure to reset starting time of the WUR duty cycle needs to be defined. | Define a procedure to reset starting time of the WUR duty cycle for the BSS. | Rejected – Synchronziation is through WUR Beacon, and STA can do compenstation using implementation specific method. Note that AP has no way to know the specific timing drift.  |
| 994 | Suzanne Leicht | 31.46 | 9.4.2.273 | Just double checking on the unit of the field for On-Duration.Table 9-318e says that it's 4 us. The Minimum Wake-up Duration field (page 34, line 31) has units of 256 us. | The unit of the field is 4 us. | Rejected – There is no conflict for unit of minimum wake-up duration and On Duration. Note that the non-AP STA can still indicate On duration larger than the minimum wake-up duration with unit of 4us. |
| 1000 | Suzanne Leicht | 34.32 | 9.4.2.275 | Are the units 256 or 4 mus for the minimum wake-up duration field ? Should this be consistent with Table 9-318e for "On Duration"? | The Minimum Wake-up Duration field indicates the minimum on duration of the WUR duty cycle operation (...) in unites of 4 mus. | Rejected – There is no conflict for unit of minimum wake-up duration and On Duration.Note that the non-AP STA can still indicate On duration larger than the minimum wake-up duration with unit of 4us. |
| 1092 | Xiaofei Wang | 30.26 | 9.4.2.273 | Does the WUR parameter field from WUR AP always contain "Starting time of the WUR Duty cycle" even if the STA is not requesting Duty Cycle operation? | please clarify, and make the field optional if the field is not always included | Revised – Agree in principle with the commeter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 1092. |
| 1229 | Yunsong Yang | 31.31 | 9.4.2.273 | WUR AP shouldn't let the WUR STAs decide the On Duration and Duty Cycle Period values. Instead, a WUR STA should just indicate the preferred WUR duty-ratio in Table 9-318e, based on the power saving that it wishes. Then, the AP decides on the values of the On Duration, Duty Cycle Period, and Starting Time of the WUR Duty Cycle for this WUR STA, taking into the consideration of these parameters for other WUR STAs. Right now, the WUR AP can only decide on the value of the Starting Time of the WUR Duty Cycle. That is insufficient for the AP to optomize the WUR operations. | Delete the rows of "On Duration" and "Duty Cycle Period" from Table 9-318e and add them to Table 9-318c. And add a new row of "Perferred Duty Ratio" in Table 9-318e, with the Defition column stating "Indicates the preferred duty ratio of the WURx of the WUR non-AP STA.", with the Encoding column stating "The size of the field is 1 octet. Value in the field plus 1 then divided by 256 equals to the preferred duty ratio." And delete "Minimum Wake-up Duration" field and "Duty Cycle Period Units" field from WUR Operation element. And modify the procedure text in clause 31.5 from P52L51 to P53L25 accordingly. | Rejected – We note that simply indicating Duty cycle ratio is not enough because a non-AP has delay constriant in additional to the power save constraint. To indicate the delay constraint, a non-AP STA needs to indicate Duty cycle period. If duty cycle period needs to be indicated, then indicating duty cyle ratio and indicating on duration becomes equivalent, and there is no need for further change.  |
| 535 | Lei Huang | 53.32 | 31.5 | A WUR non-AP STA knows whether its PCR component is in doze state or not. Why "assumed" is needed? | change"the PCR component of the WUR non-AP STA is assumed to be in doze state"to"the PCR component of the WUR non-AP STA is in doze state" | Accepted – |
| 115 | Alfred Asterjadhi | 53.33 | 31.5 | The PCR is not assumed to be in wake state but rather is in awake state. Also the WUR needs not be in wake state for the whole duration of the On duration, but rather the shortest amount fo time between the on duration and the duration of time at which it receives a WUR frame that causes the PCR to wake. | As in comment. | Revised – Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 115 and 535. |
| 169 | Bin Tian | 53.32 | 31.5 | "If a WUR non-AP STA is in WUR mode, and the PCR component of the WUR non-AP STA is assumed to be in doze state, the WURx of the WUR non-AP STA shall be in WURx awake state for each WUR duty cycle schedule". Why using the word "assumed"? Morevoer, the WURx shall be in the awake state for each ON period instead of entire duty cycle period. | May change to "If a WUR non-AP STA is in WUR mode, and the PCR component of the WUR non-AP STA is in doze state, the WURx of the WUR non-AP STA shall be in WURx awake state within the ON duration of each WUR duty cycle schedule. | Revised – Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 115 and 535. |
| 1156 | Yoshio Urabe | 53.32 | 31.5 | "Assumed to be" is not clear. It should be removed since the WUR non-AP STA knows the status of its PCR component. | Remove "assumed to be". | Revised – Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 115. |
| 529 | Lei Huang | 52.32 | 31.5 | "and duty cycle period.." should be changed to "duty cycle period.." | as per comment | Revised –Agree in principle with the commeter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 529. |
| 530 | Lei Huang | 52.56 | 31.5 | "WUR parameters field" should be changed to "WUR Parameters field" | as per comment | Accepted - |
| 531 | Lei Huang | 52.60 | 31.5 | "WUR parameters field" should be changed to "WUR Parameters field" | as per comment | Accepted – |
| 532 | Lei Huang | 52.64 | 31.5 | "WUR parameters field" should be changed to "WUR Parameters field" | as per comment | Accepted – |
| 856 | Po-Kai Huang | 53.01 | 31.5 | The paragraph is not needed. Based on the latest encoding, On Duration field (size 4 bytes units 4 us), can indicate exactly any value indicated by Duty cycle (2 bytes + 2 bytes Unit with granularity 4 us.) | Delete the paragraph. | Revised- Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 857 | Po-Kai Huang | 53.09 | 31.5 | The note is not needed. Based on the latest encoding, On Duration field (size 4 bytes units 4 us), can indicate exactly any value indicated by Duty cycle (2 bytes + 2 bytes Unit with granularity 4 us.) | Delete the note. | Revised- Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 534 | Lei Huang | 53.10 | 31.5 | "Duty Cycle Period field" should be changed to "Duty Cycle Period subfield" | as per comment | Revised- Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 44 | Albert Petrick | 53.06 | 31.5 | Missing period |  | Revised- Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 533 | Lei Huang | 52.07 | 31.5 | The period is missing. | as per comment | Revised- Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 724 | Minyoung Park | 53.01 | 31.5 | In the following sentence the word "treated" is vague and also '.' is missing at the end of sentence. :"For a WUR non-AP STA, if the value indicated by the On Duration subfield of the WUR Parameters field in the WUR Mode element is larger than the value indicated by the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element, then the on duration indicated by the WUR non-AP STA is treated as being equal to the value indicated by the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element"Replace the sentence with the following:"For a WUR non-AP STA, if the value indicated by the On Duration subfield of the WUR Parameters field in the WUR Mode element is larger than the value indicated by the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element, then the on duration indicated by the WUR non-AP STA is replaced by the value indicated in the Duty Cycle Period subfield of the WUR Parameters field in the WUR Mode element." | As shown in the comment. | Revised- Agree in principle with the commenter. Note that this sentence is no longer needed since the condition never happens based on the encoding in D1.0. We simply delete the sentence. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 112 | Alfred Asterjadhi | 53.01 | 31.5 | This paragraph describes the mode where the WUR STA has the WUR always on. To make it clear it would be good to define it so. E.g., a STA that operates in 100% duty cycle mode or smth like that. Also this way the note that follows this paragraph is not really needed | As in comment. | Revised- Agree in principle with the commenter. Note that this sentence is no longer needed since the condition never happens based on the encoding in D1.0. We simply delete the sentence. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 405 | James Lepp | 53.02 | 31.5 | Move this information out of the "Note" and state it as the procedure for a STA to indicate an always-on duty cycle. Don't use phrases like "STA that wants to have" in an IEEE standard. | 405 | Revised- Agree in principle with the commenter. Note that this sentence is no longer needed since the condition never happens based on the encoding in D1.0. We simply delete the sentence. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 1131 | Xiaofei Wang | 53.01 | 31.5 | Please clarify why this paragraph and the note are necessary? If On Duration has a unit of 4 us, and the basic unit of Duty cycle is multple of 4 us, then On Duration can be set to equal to the duration of Duty Cycle period. There is no reason why On Duration should be set to be larger than the Duty Cycle periods. | please clarify why this paragraph is necessary. Or remove this paragraph and the note. | Revised- Agree in principle with the commenter. Note that this sentence is no longer needed since the condition never happens based on the encoding in D1.0. We simply delete the sentence. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 113 | Alfred Asterjadhi | 53.01 | 31.5 | Not certain what this paragraph is trying to say. That the On Duration can be less than the period is obvious, as such we don't need to call it out explicitly. Unless there is a reason that I am missing. | As in comment. | Revised- Agree in principle with the commenter. Note that this sentence is no longer needed since the condition never happens based on the encoding in D1.0. We simply delete the sentence. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 856. |
| 110 | Alfred Asterjadhi | 52.44 | 31.5 | The figure seems to show that there is a frame sent which is ON duraiton long, which is not correct. Please improve the depicted components in the figure to reflect WUR Setup and the scheduled service periods and the intervals separating them. | As in comment. | Revised- Agree in principle with the commenter.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 110. |
| 406 | James Lepp | 52.48 | 31.5 | Figure 31-1 does not indicate any relation at all between Duty Cycle operation and WUR Beacon periods. If this is true can we add a statement about that to clarify. If no true can we indicate Beacons or Beacon periods in figure 31-1 | 406 | Rejected – The section is about WUR Duty cycle, and the figure is used to explain WUR duty cycle parameters. There is no need to include everything in one figure.  |
| 111 | Alfred Asterjadhi | 52.29 | 31.5 | Please describe explicitly the negotiation procedure in this case. WUR Mode Request, WUR Mode Response, cite the acknowledgment procedure for all these action frames, and specify the possible states for the negotiation. I don't think the WUR mode setup is appropriate under power management subclause. | As in comment. | Rejected – The negotiation procedure is described in 31.6.1 (WUR Mode Setup) as described in the sentence.  |
| 114 | Alfred Asterjadhi | 53.28 | 31.5 | I think a more appropriate term is WUR service period rather than WUR duty cycle schedule. | As in comment. | Rejected – We use WUR duty cycle schedule because this is about duty cycle operation. |
| 116 | Alfred Asterjadhi | 53.38 | 31.5 | These three paragraphs need improvement. Suggest to simply cover here the basic operation for reception and transmittion (actually I would even say to put them in the channel access subclause). And add an exception to this basic rule refering to the subclause where the WUR FDMA operation is defined. Also as mentioned in another comment please use the term WUR SST since this is a wellknown protocol. | As in comment. | Revised – Agree in principle with the commenter. We move the sentence to FDMA.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 342 | Jae Seung Lee | 52.33 | 31.5 | How WUR duty cycle operation is determined by the WUR channel parameter is not clearly described in this subclause. | Add description on how WUR duty cycle operation is determined by the WUR channel parameter in this subclause. | Revised – Agree in principle with the commenter. The channel parameter is described at the end of the WUR duty cycle section. We move the sentence to FDMA clause.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 343 | Jae Seung Lee | 53.38 | 31.5 | Three paragraphs from line 38 ~ 51 are related to WUR channel switching but the channel switching is not limited to WUR duty cycle operation. It is better to move these paragraphs to other part of the draft. | Move these three paragraphs related to WUR channel switching to other suitable subcluase such as WUR FDMA opration or create a new subclause for describing WUR channel swithing behavior and move these paragraphs to the new subclause. | Revised – Agree in principle with the commenter. We move the sentence to FDMA.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 429 | Jarkko Kneckt | 53.53 | 31.5 | It would be good to define whether a WUR non-AP STA receives a WUR transmission which is started during On Duration, or may the WUR non-AP STA go to Doze immediately after the On Duration regardless of ongoing transmissions | Please clarify. | Rejected – How WUR non-AP STA handls WUR reception outside on duration is implementation specific. Note that there is no WUR PPDU feedback from WUR non-AP STA.  |
| 603 | Mark Hamilton | 53.38 | 31.5 | This is an odd place to put these requirements about WUR channel usage. Suggest moving these three paragraph to be with the "set to 1" requirement(s) in 31.9. | Move the three paragraphs about WUR channel switching and channel usage to 31.9, as the alternative behavior to supporting WUR Channel Switching. | Revised – Agree in principle with the commenter. We move the sentence to FDMA.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 725 | Minyoung Park | 53.49 | 31.5 | The following sentence is not clear:"The WUR channel of a WUR non-AP STA with dot11WURChannelSwitchImplemented equal to false is the same as the channel for receiving WUR Beacon frame."Replace the sentence with the following:"If dot11WURChannelSwitchImplemented of a WUR non-AP STA is set to false, the WUR channel of the WUR non-AP STA shall be same as the channel on which the WUR non-AP STA is receiving WUR Beacon frames." | As shown in the comment. | Revised – Agree in principle with the commenter. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 725. |
| 887 | Rojan Chitrakar | 53.38 | 31.5 | Behaviour of WUR non-AP STA whose dot11WURChannelSwitchImplemented is true, is missing. | Change the paragraph as:"A WUR non-AP STA whose dot11WURChannelSwitchImplemented is false shall set the WUR Channel Switching Support subfield of the WUR Capabilities Information field of the WUR Capabilities element to 0, otherwise the WUR non-AP STA shall set the WUR Channel Switching Support subfield to 1." | Revised – Agree in principle with the commenter. We move the sentence to FDMA.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 1241 | Yunsong Yang | 53.38 | 31.5 | The three paragraphs from L38 to L52 are related to WUR FDMA operation, not WUR duty cycle operation, thus are placed at a wrong clause. | Move the cited paragraphs to clause 31.9. | Revised – Agree in principle with the commenter. We move the sentence to FDMA.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 1001 | Suzanne Leicht | 52.22 | 31.5 | Need "a" in two places and frame to be plural | ...and allows a WUR AP to manage WUR activity in the BSS by scheduling a WUR non-AP STA to receive WUR frames at different times. | Accepted -  |
| 1002 | Suzanne Leicht | 53.50 | 31.5 | make frame plural | ...the same as the channel for receiving WUR Beacon frames. | Revised – Agree in principle with the commenter. We move the sentence to FDMA and do corresponding revision.TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 116. |
| 1130 | Xiaofei Wang | 52.60 | 31.5 | In clause 9, it is said that the non-AP STA indicates its preferred "on Duration" and "duty cycle", while here it says "indicates On Duration" and "Duty cycle". Please make sure whether these indications are the final or preferred On Duration and Duty cycle. | as in comment | Revised – The indication in WUR request is final if WUR response accepts the request. Here, we are talking about the situation where negotiation is already successful. We revise the sentence to align with this understanding. TGba editor, please make changes as shown in doc 11-18/1937r0 under all headings that include CID 1130. |

**Discussion:** *None.*

**Propose:** Revised for CID 68, 73, 703, 877, 1092, 699, 530, 531, 532, 535, 115, 529, 856, 116, 725, 1001, 1130 per discussion and editing instructions in 11-18/1937r0.

***TGba editor: Change 9.4.2.273 WUR Mode element as follows: (Track change on)***

* WUR Mode element

(…existing texts …)

The WUR Parameters Control field indicates the configuration of the following WUR Parameters field. The format of the WUR Parameter Control field is shown in Figure 9-751b (WUR Parameters Control field format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 | B1 | B2                                 B7 |
|  | Group ID List Present | WUR Duty Cycle Start Time Present | Reserved |
| Bits: | 1 | 1 | 6(#1092) |
|  | * WUR Parameters Control field format
 |

The WUR Duty Cycle Start Time present subfield is set to 1 if the WUR Duty Cycle Start Time subfield is present in the following WUR Parameters field and set to 0 otherwise.(#1092)

The Group ID List Present subfield is set to 1 if the Group ID List subfield is present in the following WUR Parameters field and set to 0 otherwise.

The subfields of the WUR Parameters field sent from WUR AP are defined in Table 9-318c (Subfields of WUR Parameters field from WUR AP).

|  |
| --- |
| * Subfields of WUR Parameters field from WUR AP
 |
| **Subfield** | **Definition** | **Encoding** |
| WUR ID | A WUR identifier that uniquely identifies the WUR STA within the BSS of the AP  | An WUR identifier provided by the AP. The size of the field is 12 bits. |
| WUR Channel Offset | Indicates the channel offset to be transmitted the WUR Wake-up frame relative to the WUR primary channel (see 31.9 (WUR FDMA operation)).  | The size of the field is 3 bits. The encoding is described in Table 9-318d (WUR Channel Offset subfield encoding). |
| Reserved | Reserved field | The size of the field is 1 bit. |
| Starting Time Of The WUR Duty Cycle | TSF time of the starting point of the WUR duty cycle | The size of the field is 8 octets in units of µs. |
| Group ID List | Indicates one or more group IDs assigned to the STA | The format is shown in Figure 9-751c (Group ID List subfield format). |

(…existing texts …)

WUR AP indicates the start time of one WUR duty cycle schedule in the Starting Time Of The WUR Duty Cycle subfield of the WUR Parameters field in the WUR Mode element 31.5 (WUR duty cycle operation).

(…existing texts …)

The subfields of the WUR Parameters field sent from WUR non-AP STA are defined in Table 9-318e (Subfields of the WUR Parameters field from WUR non-AP STA).

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| * Subfields of the WUR Parameters field from WUR non-AP STA
 |
| **Subfield** | **Definition** | **Encoding** |
| On Duration | Indicates the preferred On Duration that the WURx of the WUR non-AP STA is(#703) in WURx awake state for each WUR duty cycle period(#877) (see 31.5 (WUR duty cycle operation)). | The size of the field is 4 bytes. The unit of the field is 256 µs.The size of the field is 4 octets. The unit of the field is 4 µs. |
| Duty Cycle Period | Indicates the preferred elapsed time between the start times of two successive WUR duty cycle schedules. (#68)(see 31.5 (WUR duty cycle operation)). | The size of the field is 2 bytes.The size of the field is 2 bytes.The size of the field is 2 octets. The unit of the field is indicated by the Duty Cycle Period Units field in the most recently received WUR Operation element from the associated WUR AP. (#68) |

***TGba editor: Change 9.4.2.275 WUR Operation element as follows: (Track change on)***

* WUR Operation element

The WUR Operation element contains the set of parameters necessary to support the WUR operation. The format of the WUR Operation element is defined in Figure 9-751g (WUR Operation element format).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Element ID** | **Length** | **Element ID Extension** | **Minimum Wake-up Duration** | **Duty Cycle Period Units** | **WUR Operation class** | **WUR Channel** | **WUR Beacon Period** | **Offset of Offset of Target Wake-up radio Beacon Transmission Time (TWBTT)Target Wake-up Radio Beacon Transmission Time (TWBTT)** |
| Octets: | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 |

|  |  |
| --- | --- |
|  |  |
|  | **WUR parameters** |
| Octets: | 1 |
| * WUR Operation element format
 |

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

The Minimum Wake-up Duration field indicates the minimum on duration of the WUR duty cycle operation (see 31.5 (WUR duty cycle operation)) in units of 256 µs.

The Duty Cycle Period Units field indicates the basic unit of the period of the WUR duty cycle operation (see 31.5 (WUR duty cycle operation)). The unit(#73) of the Duty Cycle Period Units field is 4 µs.

The WUR Operating Class field indicates the operating class in use for transmission of WUR frame from the WUR AP to the WUR non-AP STA. The encoding is the same as the definition of Operating Class field in 9.4.1.22 (Operating Class and Channel field)

The WUR Channel field indicates the channel in use for transmission of WUR frame from the WUR AP to the WUR non-AP STA. The encoding is the same as the definition of Channel field in 9.4.1.22 (Operating Class and Channel field).

The WUR Beacon period field represents the number of time units (TUs) between consecutive target WUR beacon transmission times (TWBTTs).

The Offset of Target Wake-up radio Beacon Transmission Time (TWBTT) field indicates the TSF time of the first TWBTT in units of TU.

The format of the WUR Parameters field is defined in Figure 9-751h (WUR Parameters field format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0          B3 | B4 | B5                    B7 |
|  | Counter | Common IPN | Reserved |
| Bits: | 4 | 1 | 3 |
| * WUR Parameters field format
 |

The Counter field indicates the current value of the Counter subfield included in the broadcast WUR Wake-up frames.

The Common IPN filed indicates if a common IPN is used for all protected WUR frames generated within the BSS (see 31.8.3 (Generation and construction of IPN for WUR frames)).

***TGba editor: Change 31.5 WUR duty cycle operation as follows: (Track change on)***

* WUR duty cycle operation

WUR duty cycle operation reduces the required amount of time that a WUR non-AP STA utilizing WUR Mode needs to be in WURx awake state after the PCR component of the WUR non-AP STA enters doze state (see 31.6 (WUR power management procedure)) and allows a WUR AP to manage WUR activity in the BSS by scheduling a WUR non-AP STA to receive WUR frames at different times. (#1001)

A WUR AP shall support WUR duty cycle operation if dot11WUROptionImplemented is true.

A WUR non-AP STA establishes WUR duty cycle operation with the WUR AP to which it is associated through WUR Mode Setup as described in 31.6.1 (WUR Mode Setup).

WUR duty cycle operation is determined by the following parameters: starting point, on duration, and duty cycle period (see Figure 31-1 (WUR Duty Cycle))(#529).(#116)

|  |
| --- |
| (#110) |
| * WUR Duty Cycle
 |

A WUR AP indicates the minimum wake-up duration in the Minimum Wake-up Duration field of the WUR Operation element and duty cycle period unit in the Duty Cycle Period Units field of the WUR Operation element.

* After a WUR non-AP STA establishes WUR duty cycle operation with a WUR AP through WUR Mode Setup as described in 31.6.1 (WUR Mode Setup): (#1130)the starting point is indicated in the WUR Duty Cycle Start Time(#699) subfield of the WUR Parameters(#530) field in the WUR Mode element transmited by the WUR AP. (#1130)
* the duty cycle period is indicated in the Duty Cycle Period subfield of the WUR Parameters(#531) field in the WUR Mode element transmitted by the WUR non-AP STA. (#1130)
* the on duration is indicated in the On Duration subfield of the WUR Parameters(#532) field in the WUR Mode element transmitted by the WUR non-AP STA.(#1130)

(#856)(#856)A WUR non-AP STA shall set the On Duration subfield of the WUR Parameters field in the WUR Mode element to indicate a duration that is larger than or equal to the duration indicated by the Minimum Wake-up Duration field in the most recently received WUR Operation element from the associated WUR AP.

The on duration in a duty cycle period of an established WUR duty cycle operation is called a WUR duty cycle schedule.

If a WUR non-AP STA is in WUR mode, and the PCR component of the WUR non-AP STA is (#535)in doze state, the WURx of the WUR non-AP STA shall be in WURx awake state within the on duration of a duty cycle period.(#115)

 (#116)

 (#116)

 (#116)

***TGba editor: Change 31.9 WUR FDMA operation as follows: (Track change on)***

* WUR FDMA operation

(#116)

A WUR non-AP STA whose dot11WURChannelSwitchImplemented is true shall set the WUR Channel
Switching Support subfield of the WUR Capabilities Information field of the WUR Capabilities element that
it transmits to 1.

When a WUR AP receives a WUR Capabilities element of which the WUR Channel Switching Support subfield of the WUR Capabilities Information field is equal to 0, the WUR AP shall set the WUR Channel Offset subfield of the WUR Parameters field of the WUR Mode element to 0. (#116)

When a WUR AP receives a WUR Capabilities element of which the WUR Channel Switching subfield of the WUR Capabilities Information field is equal to 1, the WUR AP shall set the WUR Channel Offset subfield of the WUR Parameters field of the WUR Mode element that it transmits to any value as defined in Table 9-318d (Subfields of WUR Parameters field from WUR AP), subject to the negotiated WUR duty cycle schedule does not overlap with the TWBTTs at which the WUR AP schedules for transmission WUR Beacon frames if the value of WUR Channel Offset subfield of the WUR Parameters field of the WUR Mode element that the WUR AP transmits is not 0, except for the case when the value indicated in the On Duration subfield of the WUR Parameters field in the WUR Mode element received from a WUR non-AP STA is equal to or greater than the value of the Duty Cycle Period subfield, in which case,

* The negotiated WUR duty cycle schedule may overlap with the TWBTTs.
* The WUR AP shall not transmit any WUR frame addressed to the WUR non-AP STA for aPPDUMaxTime defined in Table 21-29 (VHT PHY characteristics) from a TWBTT.

If dot11WURChannelSwitchImplemented of a WUR non-AP STA is set to false, the WUR channel of the WUR non-AP STA shall be same as the channel on which the WUR Beacon frames are transmitted. (#116, #725)

The WUR channel of a WUR non-AP STA with dot11WURChannelSwitchImplemented equal to true is defined by the WUR Channel Offset subfield of the WUR Parameters field of the WUR Mode element that it receives from its associated WUR AP.