IEEE P802.11  
Wireless LANs

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| Comment resolutions for Clause 1, Clause 3, Clause 4 | | | | |
| Date: 2019-3-8 | | | | |
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Abstract

This submission proposes resolutions for multiple comments related to TGba D2.0 with the following CIDs (39 CIDs):

* 2011, 2014, 2082, 2134, 2148
* 2158, 2161, 2191, 2192, 2193
* 2194, 2197, 2230, 2237, 2239
* 2240, 2244, 2245, 2246, 2247
* 2248, 2249, 2250, 2251, 2502
* 2503, 2504, 2566, 2575, 2650
* 2707, 2708, 2709, 2710, 2712
* 2761, 2394, 2177, 2179

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 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba 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** | **Clause Number** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 2011 | Albert Petrick | 4.3.15a | 21 | 13 | The title for clause 4.3.15a Wake-up radio (WUR) STA should include WUR AP. The text in this clause describes both WUR STA and WUR AP at a high level | Change title to: "Wake-Up radio (WUR) STA | Revised.  To clarify that the subclause 4.3.15a describes both WUR AP and WUR non-AP STA, the title of the clause is changed to “Wake-up radio (WUR) AP and WUR non-AP STA”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2011. |
| 2014 | Albert Petrick | 4.3.15a | 21 | 49 | Clause 4 describes features for WUR AP, based on the 40 and 80 MHz channel BW. This should be highlighted as applied to the 5 GHz band. | Add sentence that reads: "In the 5 GHz band, the following applies: " | Revised.  To clarify that the 80 MHz WUR PPDU transmission is applied to the 5 GHz band, a note is added as follows: “Note: 80 MHz WUR PPDU and 80 MHz subchannel punctured WUR PPDU applies to the 5 GHz band.”  Since 40MHz PPDU transmission is allowed in the 2.4 GHz, the 40MHz PPDU transmission is not included in the note.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2014. |
| 2082 | Bo Sun | 4.9 | 22 | 24 | The WUR MAC function is working together with primary radio MAC. But it's not like the backward compatibility as 11ax to 11ac, nor the parallel PHY/MAC as 11ad. It seems the WUR MAC works as an extention to its partner primary radio MAC. It's necessary to clarify the relation between the WUR MAC and its partner primary radio MAC in the spec. | Add a reference model to illustrate the relation between WUR MAC and its partner primary radio MAC in sub-clause 4.9. Or specfiy the relation somewhere in the spec. | Rejected.  In D2.0, the definition of a WUR AP is as follows: “A WUR AP is a non-HT, HT, VHT, or HE AP that is capable of transmitting a WUR PPDU.” The definition of a WUR non-AP STA is as follows: “A WUR non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR PPDU and is not capable of transmitting a WUR PPDU.” D2.0 also removed the PCR and WURx terminologies in order to clarify that WUR is an additional capability to the non-HT, HT, VHT, or HE STAs similar to the HE STA having new capabilities to the VHT STA. Therefore, there is no need to define the relationship between the WUR MAC and the non-HT, HT, VHT, or HE MAC. |
| 2134 | James Lepp | 4.3.15a | 21 | 18 | There is no need to state that the Non-AP STA is not capable of transmitting a WUR PPDU. This may be true in some or even most cases, but is not relevant to these requirements. "A WUR non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR PPDU and is not capable of transmitting a WUR PPDU." | Remove "and is not capable of transmitting a WUR PPDU." | Revised.  Agree with the commenter. The capability to transmit a WUR PPDU from the WUR non-AP STA can be left to implementation specific. The sentence is removed and added a note saying that it is implementation specific and out of scope of the spec.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2134. |
| 2177 | Joseph Levy | 3.2 | 19 | 32 | The definition is defining a non-AP STA not a WUR non-AP STA as it should be doing. | Change the beginning of the definition to read: "A WUR non-AP STA is a ...." | Accepted. |
| 2179 | Joseph Levy | 3.2 | 19 | 34 | It is not necessary to state what a WUR non-AP STA is not capable of doing as the list is probably endless. Therefore remove the statement that it is not capable of transiting WUR PPDUs. | Delete: "and is not capable of transmitting a WUR physical layer (PHY) protocol data unit (PPDU)" | Accepted. |
| 2148 | James Lepp | 4.3.15a | 22 | 7 | Move "Receive a WUR Beacon frame." to the optional features section. This isn't required for stationary IOT devices deployed without a duty cycle. | Move "Receive a WUR Beacon frame." to the optional features section. | Rejected.  The WUR Beacon frame is not only used for time synchronization for the duty cycle operation but also used as a “heartbeat” function that a WUR non-AP STA knows whether the WUR AP is still operational or still within the range. Therefore, it needs to be a mandatory feature. |
| 2158 | James Lepp | 4.3.15a | 22 | 17 | Move "Receive a protected WUR frame." to the mandatory main features section. This is needed for security of the system and is already mandatory for the WUR AP. | Move "Receive a protected WUR frame." to the mandatory main features section. | Rejected.  The support of the WUR protected frame at the WUR AP is optional. Therefore, the reception capability of the protected WUR frame should be also optional. |
| 2161 | Jarkko Kneckt | 4.3.15a | 21 | 26 | The WUR does not have large impact on the duration that a STA may sleep, becauee WUR STA needs to wake up to receive the group addresssed frames after DTIM beacon. Writing a possibility to sleep longer due to WUR is inaccurate and misleading. This statement should be clarified and there should be context, how much longer WUR enables a STA to sleep. | Please clarify the statement: "WUR non-AP STAs to remain in power save for longer periods of time" | Revised.  Agree with the commenter that a WUR non-AP STA can sleep when there is no data to receive. The sentence is modified as follows: “…which enables the WUR non-AP STAs to remain in power  save for longer periods of time when there is no data to receive…”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2161. |
| 2191 | Joseph Levy | 4.3.15a | 21 | 13 | The title this section WUR STA is very confusing because there is no common WUR STA component that is in both APs and non-AP STAs as in previous 802.11 amendments. There is only are only WUR AP and a WUR non-AP STA components which do not share a common STA component. | Retile this section "Wake-up Radio (WUR) AP and WUR non-AP STA" or "Wake-up Radio (WUR) Components" | Revised.  To clarify that the subclause 4.3.15a describes both WUR AP and WUR non-AP STA, the title of the clause is changed to “Wake-up radio (WUR) AP and WUR non-AP STA”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2191. |
| 2192 | Joseph Levy | 4.3.15a | 21 | 14 | Since a WUR AP and a WUR non-AP STA are significantly different than a typical 802.11 AP or 802.11 STA description. e.g. only the WUR AP transmits WUR PPDUs while a WUR non-AP STA only receives WUR PPDUs. This is a fundamental change in STA function relative to the rest of 802.11 STAs where STAs transmit and receive the same types of PPDUs. This architectural concept should be described before the introduction of the capabilities of each of the components. | Add a descriptive paragraph that provides an overall description of how the two components relate and function to provide the WUR capability. If desired, the commenter is willing to provide a contribution to resolve this comment. | Revised.  In D2.0, the definition of a WUR AP is described as follows: “A WUR AP is a non-HT, HT, VHT, or HE AP that is capable of transmitting a WUR PPDU.” The definition of a WUR non-AP STA is described as follows: “A WUR non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR PPDU and is not capable of transmitting a WUR PPDU.” Basically, a WUR AP and a WUR non-AP STA are regular AP and non-AP STA that have additional capability to transmit and receive WUR PPDUs. There are four types of WUR frames defined in the spec to provide the following functions: WUR Beacon for the synchronization and duty-cycle operation, WUR Wake-up frame to indicate there is buffered data at the AP, the WUR Discovery frame to enable low power discovery function, and the WUR Vendor Specific frame that can be used for vendor specific purposes.  The necessary information that describes the definitions and functions is already in D2.0 but to better clarify these points, the paragraph has been modified as follows “…  at a very low power consumption less than 1 milliwatt. A WUR PPDU carries a WUR frame. A WUR AP transmits a WUR PPDU to a WUR non-AP STA and provides the following four functions~~.~~  ~~Four WUR frames are defined~~:”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2192. |
| 2193 | Joseph Levy | 4.3.15a | 21 | 14 | It is critical to inform the reader that a WUR AP and WUR non-AP STA both support a new type of power saving (WUR) that enable the WUR AP to wake the WUR non-AP STA, and allows the WUR non-AP STA to be in a very low power consumption state (less than 1 milliwatt). | Add a descriptive paragraph that provides an overall description of how power save works with WUR capabilities. If desired, the commenter is willing to provide a contribution to resolve this comment. If desired, the commenter is willing to provide a contribution to resolve this comment. | Revised.  In D2.0 P21L20 and L26, “A WUR non-AP STA has a capability to receive a WUR PPDU at a very low power consumption less than 1 milliwatt” and “The WUR Wake-up frame provides notification to a WUR non-AP STA(s) that a WUR AP has buffered data for the WUR non-AP STA(s), which enables the WUR non-AP STAs to remain in power save for longer periods of time and enables the WUR non-AP STAs to react to incoming traffic and critical update of BSS parameters with low latency” describe the new capability of a WUR AP and a WUR non-AP STA. To help the reader to understand better about the details of the WUR power management procedure, the reference to the WUR power management is added to the paragraph.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2193. |
| 2194 | Joseph Levy | 4.3.15.a | 21 | 20 | It would be clearer if the types of frames transmitted by the WUR AP were described after the introduction of the WUR AP, not as part of the WUR non-AP STA. | Move the description of transmitted frames to follow the WUR AP description on line 15. | Revised.  Since the WUR AP and the WUR non-AP STA are both used in the WUR frame descriptions, it is better to have the definitions of the WUR-AP and the WUR non-AP STA first and then have the WUR frame descriptions. To improve the flow, the paragraph that defines the WUR non-AP STA is separated into two: one for the WUR non-AP STA definition and the other for the description of the WUR frames. The definition of the WUR AP is moved after the definition of the WUR non-AP STA.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2194. |
| 2197 | Joseph Levy | 4.3.15.a | 21 | 35 | While listing the mandatory and optional feature in clause 4 seems to be "standard practice" at this time, it really violates the style guide and does not really provide a useful description of the WUR capability. I suggest removing these lists from clause 4. | Delete the mandatory and optional main features list and replace it with a useful description of WUR functionality and pointers to where detailed information can be found in the specification. | Rejected.  In the style guide (11-09/1034r12), it reads “Clause 4 provides a general description of the wireless system. It should be written in declarative, not normative, language.” Based on this guideline, the current description of the mandatory and optional features listed in the clause seems to be not violating the guideline. The style guide doesn’t say listing the mandatory and optional features is prohibited. |
| 2230 | kaiying Lv | 4.3.15a | 21 | 19 | Both "WUR group ID" and "WUR Group ID" are used in the draft.. | Make the words used consistently. | Rejected.  WUR group ID doesn’t exist in P21L19. However, by searching the occurances there are both WUR group ID and WUR Group ID and in 4.3.15a it is used to indicate the concept of the group ID rather than a specific name of a field. Based on couple of searches, it seems that the usages of WUR group ID and WUR Group ID are consistent. |
| 2237 | kaiying Lv | 4.3.15a | 21 | 37 | Need the definitions of 20 MHz WUR PPDU, 40 MHz WUR PPDU, 80 MHz WUR PPDU and 80 MHz WUR subchannel punctured PPDU | As in comment | Revised.  Clause 31.2.2 defines WUR PPDU format for 20 MHz operation and clause 31.2.3 defines WUR FDMA PPDU for 40 and 80 MHz and subchannel puncturing operations. To clarify this, 20 MHz WUR PPDU is changed to WUR PPDU for the 20 MHz channel bandwidth, “—Transmit a 40 MHz WUR PPDU or an 80 MHz WUR PPDU” and “—Transmit an 80 MHz subchannel punctured WUR PPDU” are rephrased to support of FDMA PPDU, the definition of WUR PPDU is modified and the definition of the WUR FDMA PPDU is added in clause 3.2.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2237. |
| 2239 | Kazuyuki Sakoda | 4.3.15a | 21 | 20 | Sentence reads: "... less than 1 milliwatt." | Less than 1 milliwatt depends on implementation. The standard should describe low power capability with more objective manner. | Rejected.  The PAR of TGba requires the active power consumption of the receiver that receives a WUR PPDU to be less than 1 milliwatt. |
| 2240 | Kazuyuki Sakoda | 4 | 21 | 2 | Ideally, there should be an introductory description on what are WUR STAs with high level features of the WUR. | Please consider to add a subclause under 4.3.15a describing general high level features of the WUR STAs. It will be also helpful for readers if this new section contains cross references to the clausese where WUR normative behaviors are described. | Revised.  The high level functions are described by explaining the functions of each WUR frame and the mandatory and optional features are listed after that. For clarification, the “Four WUR frames are defined” is rephrased as “and the four types of WUR frames provide the following four functions”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2240. |
| 2244 | Lei Huang | 4.3.15a | 21 | 15 | For keeping consistency with clause 3.2, a WUR AP should be defined as "a non-HT, HT, VHT, or HE AP that is capable of transmitting a WUR PPDU and supports the WUR mechanism". | as in comment | Accepted. |
| 2245 | Lei Huang | 4.3.15a | 21 | 18 | For keeping consistency with clause 3.2, a WUR non-AP STA should be defined as "a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR PPDU and is not capable of transmitting a WUR PPDU and supports the WUR mechanism" | as in comment | Revised.  The phrase “and supports the WUR mechanism” is added to the sentence.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2245. |
| 2246 | Lei Huang | 4.3.15a | 21 | 24 | For better accuracy, "a WUR AP" should be "a WUR AP transmitting the WUR Beacon frame" | as in comment | Revised.  Rephrased to “a WUR AP that is transmitting the WUR Beacon frame”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2246. |
| 2247 | Lei Huang | 4.3.15a | 21 | 31 | what "low power discovery" does mean? | change this sentence to " The WUR Discovery frame supports discovery of WUR APs with low power consumption. | Revised.  The sentence is rephrased to clarify the meaning.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2247. |
| 2248 | Lei Huang | 4.3.15a | 21 | 37 | since WUR AP shall support all the data rates, both sentences "Transmit a 20 MHz WUR PPDU at LDR" and "Transmit a 20 MHz WUR PPDU at HDR" can be simply merged into a single sentence "Transmit a 20 MHz WUR PPDU" | as in comment | Rejected.  Separating LDR and HDR support is useful to the reader to know that there are two data rates supported in this amendment. |
| 2249 | Lei Huang | 4.3.15a | 21 | 51 | A 40 MHz WUR PPDU, an 80 MHz WUR PPDU and an 80 MHz subchannel punctured WUR PPDU belong to WUR FDMA PPDU. So both two sentences "Transmit a 40 MHz WUR PPDU or an 80 MHz WUR PPDU" and "Transmit an 80 MHz subchannel punctured WUR PPDU" can be simply merged into a single sentence "Transmit a WUR FDMA PPDU" | as in comment | Revised.  Agree in principle. The two sentences are rephrased in a single sentence “—Transmit a WUR FDMA PPDU on a 40 MHz or 80 MHz channel”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2249. |
| 2250 | Lei Huang | 4.3.15a | 21 | 40 | "WUR power management procedure" should be "support of WUR power management procedure" "WUR wake-up operation" should be " support of WUR wake-up operation" "WUR duty cycle operation" should be " support of WUR duty cycle operation" | as in comment | Revised.  Agree with the commenter. Added “Support of the” in front of WUR power management procedure, WUR wake-up operation, WUR duty cycle operation.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2250. |
| 2251 | Lei Huang | 4.3.15a | 22 | 1 | "WUR power management procedure" should be "support of WUR power management procedure" "WUR wake-up operation" should be " support of WUR wake-up operation" | as in comment | Revised.  Agree with the commenter. Added “Support of the” in front of WUR power management procedure, WUR wake-up operation  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2251. |
| 2502 | Osama Aboulmagd | 4.3.15a | 21 | 16 | WUR PPDU needs to be defined in the same way other types of PPDUs are defined, e.g. VHT PPDU. | Add a definition for WUR PPDU in clause 3.2 | Revised.  Agree with the commenter. Modified the definition of WUR PPDU and added the definition of the WUR FDMA PPDU.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2502. |
| 2503 | Osama Aboulmagd | 4.3.15a | 21 | 16 | Is WUR applicable only to non-HT, VHT, or HE devices. How about EHT and beyond? | Perhaps a more generic description can cover the present and the future. Need to draft a definition. | Rejected.  As shown in the cover page of the amendment, the amendment is based on the current baseline standard (REVmd), 802.11ax, 802.11ay, 802.11az and does not cover the future amendments following after the TGba. There can be another project TGxx after the EHT and beyond that can define the support of WUR for the EHT or later amendments. |
| 2504 | Osama Aboulmagd | 4.3.15a | 21 | 15 | It would be helpful mentioning the bands where WUR operated in clause 4.3.15a. The bands were mentioned later in the draft. Stating the bands of operation upfront is useful. | add "WUR operates in the 3.4 Ghz and 5GHz bands" | Revised.  Based on the TGba functional requirement document (11-17/39r2), TGba R5 “TGba R5 The 802.11ba amendment shall define operations for 2.4 GHz and 5 GHz bands.” Added a sentence “The transmission and reception of WUR PPDUs and WUR FDMA PPDUs are defined in the 2.4 GHz and 5 GHz bands.”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2504. |
| 2566 | Robert Stacey | 4.3.15a | 21 | 20 | As a receive power, 1 milliwatt (= 0 dBm) is not "very low". I would expect receive sensitivity to be around the sensitivty of the main radio (at least -82 dBm). Anyway, it is the power consumption of the receiver itself (the implementation) that we care. | Change to something like: WUR operation is defined to support a receiver architecture [or no-AP STA implementaion] that operates with an average power consumption of less than 1 milliwatt. | Revised.  Since “very low” is subjective, remove from the sentence and added “of” in front of “less than”. It is not a receive power but the power consumption of a WUR non-AP STA.  The TGba PAR requires the development of a capability of a WUR non-AP STA to receive a WUR PPDU at the active power consumption less than 1 milliwatt.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2566. |
| 2575 | Rojan Chitrakar | 4.3.15a | 22 | 11 | A WUR non-AP STA that supports reception of WUR PPDU with High Data Rate may fail to receive the WUR frame in bad channel conditions. In such situations, it would be better for the WUR AP to switch to Low Data Rate; however currently there is no mechanism for WUR STAs to provide feedback to the WUR AP. | In the event of CRC or MIC errors during reception of WUR PPDUs carrying WUR frames with High Data Rate addressed to a WUR non-AP STA, add options for the STA to provide feedback to the AP in one of the following two ways: 1) As an Event Report e.g. "FCS Error Event" 2) As a request to switch to Low Data Rate Based on the feedback from the STA, AP can decide to use the more robust LDR for subsequent WUR frames addressed to the STA. | Rejected.  Invalid comment. The commenter failed to identify the problem in P22L11 and didn’t provide the changes that can be made in 4.3.15a. |
| 2650 | Stephen McCann | 4.3.15a | 21 | 26 | The term "WUR Wake-up" should not be used, as this expands to Wake-up radio Wake-up, which is redundant. | Replace all occurances of "WUR Wake-up" with "WUR trigger" or a similar term. | Rejected.  In the term “WUR Wake-up”, WUR stands for Wake-up radio, which describes the overall concept of TGba operation and “Wake-up” describes the function that is provided by the frame. A WUR frame indicates that it is a frame that is carried in the WUR PPDU format. Depending on the function of a WUR frame, a name is given to each WUR frame. A WUR frame that provides a beacon function was called WUR Beacon frame. A WUR frame that provides a “wake-up” function is called WUR Wake-up frame” and so on. Hope this explanation resolves your comment. |
| 2707 | Xiaofei Wang | 4.3.15a | 21 | 15 | "a WUR PPDU" seems to be rather limiting. Suggest to change it to "WUR PPDUs" | as in comment. | Accepted. |
| 2708 | Xiaofei Wang | 4.3.15a | 21 | 18 | "receive a WUR PPDU" seems to be rather limiting. Suggest to change it to "receiving WUR PPDUs" | as in comment. | Accepted. |
| 2709 | Xiaofei Wang | 4.3.15a | 21 | 19 | I believe that the sentence "A WUR non-AP STA has a capability to receive a WUR PPDU at a very low power consumption less than 1 milliwatt." is not correct. A WUR receiver should be capable of operating at 1 milliwatt, which includes monitoring the medium, receive a packet, decide whether the packet is a WUR frame destined to itself. If the power restriction is only on receiving a PPDU, does it imply that there is no limitation on monitoring the medium, which may be majority of the time in which a WUR operates. | please provide a more complete requirements on power consumptions for WUR STAs. | Rejected.  The TGba PAR requires the development of a capability of a WUR non-AP STA to receive a WUR PPDU at the active power consumption less than 1 milliwatt. For a typical receiver design, it is well accepted that monitoring the medium consumes less than decoding the packet. |
| 2710 | Xiaofei Wang | 4.3.15a | 21 | 22 | "four WUR frames" seems not to be correct. Suggest to change it to "Four types of WUR frames". In addition, do we need to describe frames definition in Clause 4? | as in comment. | Revised.  Changed “Four WUR frames” to “four types of WUR frames”.  The purpose of the description of WUR frames was to explain the functions provided by the transmission and reception of the WUR frames, which is the main operation of the amendment.  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2710. |
| 2712 | Xiaofei Wang | 4.3.15a | 21 | 33 | the phrase "a vendor specific operation" seems to be awkward and too restrictive. Suggest to change to "vendor specific operations". | as in comment. | Accepted. |
| 2761 | Yonggang Fang | 4.3.15a | 21 | 23 | What is the "WUR beacon frame"? Is it a regular beacon frame which carries the WUR Capabilities, WUR Operation and WUR Discovery information? It is better to define in the section 3.2. | Please clarify | Rejected.  WUR Beacon frame is a WUR frame that is carried in a WUR PPDU that provides the time synchronization between a WUR non-AP STA and a WUR AP. There are four types of WUR frames defined in the amendment and typically the definition of a frame is not included in clause 3.2 because there are too many frames defined in the standard (i.e. this will mean moving clause 9 and other frame definition sections to clause 3.2). |
| 2394 | Mark Hamilton | 1.3 | 19 | 1 | This amendment should add a purpose statement in subclause 1.3 | Add a change to subclause 1.3, "Insert at the end of the dashed list in 1.3: - Defines a mechanism for a device to receive a wake-up signal using very low power, thus enabling extremely low power consumpiton while in a sleep mode. | Revised.  Agree with the commenter. Added the following sentence:  “Defines a mechanism to enable IEEE 802.11 stations to operate at extremely low power consumpiton when there is no data activity and to react to incoming traffic with low latency through wake-up signal”  TGba editor to make the changes shown in doc.: IEEE 802.11-19/0410r2 under all headings that include CID 2394. |

**TGba Editor: *Change the subclauses below in TGba Draft 2.0 as follows:***

**1.3 Supplementary information on purpose**

**…**

-- Defines mechanisms to enable delivery of preassociation service discovery information to IEEE  
802.11 stations (STAs).(11aq)

-- Defines a mechanism to enable IEEE 802.11 stations to operate at extremely low power consumpiton when there is no data activity and to react to incoming traffic with low latency through wake-up signal.(#2394)

* Definitions, acronyms, and abbreviations
* Definitions specific to IEEE Std 802.11

**wake-up radio (WUR) non-access-point (non-AP) station (STA):** A WUR non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving a WUR physical layer (PHY) protocol data unit (PPDU) and supports the WUR mechanism.(#2177, 2179)

**wake-up radio (WUR) physical layer (PHY) protocol data unit (PPDU):** A PPDU transmitted with the TXVECTOR parameter FORMAT equal to WUR and TXVECTOR parameter CH\_BANDWIDTH equal to WUR\_CBW\_20.(#2237, 2502)

**wake-up radio (WUR) frequency division multiple access (FDMA) physical layer (PHY) protocol data unit (PPDU):** A PPDU transmitted with the TXVECTOR parameter FORMAT equal to WUR\_FDMA and TXVECTOR parameter CH\_BANDWIDTH equal to WUR\_CBW\_40 or WUR\_CBW\_80 or WUR\_CBW\_PUNC80-PRI or WUR\_CBW\_PUNC80-SEC.(#2237, 2502)

* Wake-up radio (WUR) AP and WUR non-AP STA (#2011, 2191)

(#2194)

A WUR non-AP STA is a non-HT, HT, VHT, or HE non-AP STA that is capable of receiving WUR PPDUs (#2708) and supports the WUR mechanism (#2245)(#2134, 2179). A WUR non-AP STA has a capability to receive a WUR PPDU at a (#2566) power consumption of less than 1 milliwatt. (#2194)

s (#2194, 2707) and supports the WUR mechanism. (#2244)

A WUR PPDU carries a WUR frame. A WUR AP transmits a WUR PPDU to a WUR non-AP STA and the four types of WUR frames provide the following four functions (#2192, 2240, 2710):

* The WUR Beacon frame helps maintaining timing synchronization between a WUR non-AP STA and a WUR AP that is transmitting the WUR Beacon frame (#2246) and enables the WUR duty cycle operation.
* The WUR Wake-up frame provides notification to a WUR non-AP STA(s) that a WUR AP has buffered data for the WUR non-AP STA(s), which enables the WUR non-AP STAs to remain in power save for longer periods of time when there is no data to receive (#2161) and enables the WUR non-AP STAs to react to incoming traffic and critical update of BSS parameters with low latency.
* The WUR Discovery frame supports a WUR non-AP STA to discover WUR APs at low power consumption.(#2247)
* The WUR Vendor Specific frame supports vendor specific operations.(#489, #59)(#2712)

The transmission and reception of WUR PPDUs and WUR FDMA PPDUs are defined in the 2.4 GHz and 5 GHz bands. (#2504)

The details of the WUR power management procedure is defined in 30.7 (WUR power management procedure).(#2193)

Note: The capability to transmit a WUR PPDU by a WUR non-AP STA is implementation specific and is out of scope of the standard.(#2134)

A WUR AP has the following mandatory main features:

* Transmit a WUR PPDU on a 20 MHz channel at LDR.(#57)(#2237)
* Transmit a WUR PPDU on a 20 MHz channel at HDR.(#57)(#2237)
* Support of the WUR power management procedure.(#2250)
* Support of the WUR wake-up operation.(#2250)
* Support of the WUR duty cycle operation.(#2250)
* Transmit an individually addressed FL WUR Wake-up frame. (#288, #57)
* Transmit a broadcast FL WUR Wake-up frame. (#288, #57)
* Transmit a WUR Beacon frame.

A WUR AP has the following optional main features:

* Transmit a WUR FDMA PPDU on a 40 MHz or 80 MHz channel(#2237, 2249) (#2237)
* Transmit a VL WUR frame. (#288, #57)
* Transmit a protected WUR frame.
* Transmit a WUR Wake-up frame with a WUR group ID.
* Transmit a WUR Discovery frame.
* Transmit a WUR Vendor Specific frame.

Note: 80 MHz WUR PPDU and 80 MHz subchannel punctured WUR PPDU applies to the 5 GHz band. (#2014)

A WUR non-AP STA has the following mandatory main features:

* Receive a 20 MHz WUR PPDU at LDR.(#57)
* Support of the WUR power management procedure. (#2251)
* Support of the WUR wake-up operation.(#2251)
* Receive an individually addressed FL WUR Wake-up frame. (#288, #57)
* Receive a broadcast FL WUR Wake-up frame. (#288, #57)
* Receive a WUR Beacon frame.

A WUR non-AP STA has the following optional main features:

* Receive a 20 MHz WUR PPDU at HDR.(#57)
* Support of WUR FDMA operation (see 30.10 (WUR FDMA operation)).(#690, #58)
* Support of the WUR duty cycle operation (see 30.6 (WUR duty cycle operation)).(#58)
* Receive a VL WUR frame. (#288)
* Receive a protected WUR frame.
* Receive a WUR Wake-up frame with a WUR group ID.
* Receive a WUR Discovery frame.
* Receive a WUR Vendor Specific frame.