IEEE P802.11
Wireless LANs

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| Comment resolutions for WUR HDR and LDR  |
| Date: 2018-1-9 |
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Abstract

This submission proposes resolutions for multiple comments related to TGba D1.0 with the following CIDs (13 CIDs):

* 509, 629, 640, 689, 741, 831, 819, 821, 822, 220, 243, 820, 709

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Added CIDs 220, 243

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** |
| 509 | Lei Huang | 4.3.15a | 21 | 29 | WUR only supports two data rates: LDR and HDR. The first and second mandatory main features can be merged into one. | change"--Transmit 20 MHz WUR PPDU with Low Data Rate. --Transmit 20 MHz WUR PPDU with High Data Rate."to"--Transmit 20 MHz WUR PPDU" | Rejected.Since the WUR non-AP STA does only supports LDR as the mandatory rate, it will be better to have them separate in the WUR AP side as well so that the reader can know the difference clearly. |
| 629 | Michael Fischer | 4.3.15a | 21 | 29 | There is insufficient need to define two, different data rates. WUR should be simple and fully interoperable, and with only a 4X difference in data rate, there is not enough benefit regarding throughput difference to justify the complexity of supporting two data rates (and if there is enough benefit regarding some other PHY characteristic of interest, such is not stated in the draft). If HDR is optional, you cannot rely in its being available, so the analytical bases of all WUR-capable AP design decisions needs to assume LDR. Note that this introductory section does include an expected power consumption of the WURx radio at non-AP stations, but does not include any rationale for why having both LDR and HDR is expected to be beneficial. | Choose one data rate and use it throughout. If you cannot agree on whether it should be 62.5 Kb/s or 250 Kb/s, use 125 Kb/s. Also make the associated changes such as one sync field length, removal of the HDR capability bits, etc. | Rejected.The LDR is necessary to support the same range as non-HT, HT, VHT PHY range. The HDR is necessary to provide more efficient WUR operation with less overhead when a STA is close to an AP. Therefore, the LDR and HDR are both required in the WUR operation. |
| 640 | Michael Fischer | 32.1 | 65 | 30 | There should be only one data rate. WUR is supposed to be simple and deployable with very high interoperability. There is no stated reason for having two data rates, which is particularly needed because the two rates are so similar. Furthermore, in this clause several things are stated to be optional, including channels wider than 20MHz and FDMA operation, but there is no statement that HDR is optional, even though such is stated in clause 4. | Choose one data rate and one WUR sync duration. If you cannot agree on whether it should be 62.5 Kb/s or 250 Kb/s, split the difference and use 125 Kb/s (either by using LDR OOK symbols with 2us ON and OFF periods or HDR OOK symbols with 4us ON and OFF periods). My recommendation is to use 250 Kb/s, and 64us sync field, because that requires slightly over 700us to transmit a maximum-length PPDU, whereas at 62.5 Kb/s a maximum-length PPDU requires 2986us. Viewed in isolation, spending 3% of the default beacon interval to send a single WUR PPDU may be acceptable, but in actual networks there are likely to be VHT and/or EHT stations attempting to make use of the very and/or extremely high throughput, and to them using 3% of the beacon interval to wake up one (or a small set of) ultra-low-power station(s) looks more like excessive overhead. | Rejected.The LDR is necessary to support the same range as non-HT, HT, VHT PHY range. The HDR is necessary to provide more efficient WUR operation with less overhead when a STA is close to an AP. Therefore, the LDR and HDR are both required in the WUR operation. |
| 689 | Minyoung Park | 4.3.15a | 21 | 9 | "Transmit 20 MHz WUR PPDU with High Data Rate" should be an optional feature since the reception of the WUR PPDU at High Data Rate is optional. | Delete the following sentence from P21L9 "-- Transmit 20 MHz WUR PPDU with High Data Rate"and add the following to P21L43:"-- Transmit 20 MHz WUR PPDU with High Data Rate" | Revised.Discussion: Mandating the HDR at the AP gives more burden to the AP implementation to add the WUR to the existing AP implementation. Since the WUR only works when the AP supports the WUR, it is important to implement the spec such that there is a minimum set of mandatory features that are really needed to make WUR work so that the WUR is easily adopted by the AP implementersTGba editor to make the changes shown in doc.: IEEE 802.11-19/0023r1 under all headings that include CID 689. |
| 741 | Minyoung Park | 32.1 | 65 | 51 | The 20 MHz WUR PPDU transmission at HDR should be optional since it is optional for the WUR non-AP STA. | Delete the following sentence ""A WUR PPDU with 20 MHz channel width, High Data Rate, and single stream"" and add it after the following sentence in P65L59 as follows: | Revised.Discussion: Mandating the HDR at the AP gives more burden to the AP implementation to add the WUR to the existing AP implementation. Since the WUR only works when the AP supports the WUR, it is important to implement the spec such that there is a minimum set of mandatory features that are really needed to make WUR work so that the WUR is easily adopted by the AP implementers.TGba editor to make the changes shown in doc.: IEEE 802.11-19/0023r1 under all headings that include CID 741. |
| 831 | Po-Kai Huang | 4.3.15a | 21 | 31 | Mandating WUR AP to support HDR may slow down the adoption rate of 11ba on existing AP. Specifically, HDR has a 2us symbol boundary on the data field, which is different from the existing 4us symbol boundary supported by 11n/ac/ax APs. As a result, mandating HDR for WUR AP will require more HW change for the existing AP. On the other hand, if we only mandate LDR for WUR AP, then we may have a chance to allow SW and firmware update for existing AP to support 11ba. Note that it is true that WUR sync field also has 2 us boundary. However, WUR sync field is fixed and can be created and saved in a buffer. Since WUR data field is not fixed, further HW change is then required. | Make it optional for AP to support transmitting WUR frame with HDR. |  Revised.Discussion: Mandating the HDR at the AP gives more burden to the AP implementation to add the WUR to the existing AP implementation. Since the WUR only works when the AP supports the WUR, it is important to implement the spec such that there is a minimum set of mandatory features that are really needed to make WUR work so that the WUR is easily adopted by the AP implementers.The resolution is same as the resolution of the CID 689.TGba editor: No changes required. The resolution is same as the comment resolution of the CID 689. |
| 819 | Peter Loc | 4.3.15a | 21 | 58 | To simplify the spec., implementation and WUR operation, receive 20 MHz WUR PPDU with High Data Rate should be mandatory for WUR non-AP STA. It is a fairly simple effort to add this capability in the WUR non-AP STA considering that the spec. already requires the WUR non-AP STA to implement a mechanism to receive Low Data Rate. | Add after line 58 the following bullet "- Receive 20 MHz WUR PPDU with High Data Rate." | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 821 | Peter Loc | 32.1 | 65 | 56 | Propose that WUR non-AP STA to support Receive 20 MHz WUR PPDU with High Data Rate as a mandatory feature | Add after line 57: "A WUR PPDU with 20 MHz channel width, High Data Rate, and single stream" | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 822 | Peter Loc | 9.4.2.274 | 33 | 56 | Propose that WUR non-AP STA to support Receive 20 MHz WUR PPDU with High Data Rate as a mandatory feature | In table 9.318f, change subfield "20 MHz WUR PPDU with HDR Support" to Reserved | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 220 | Dong Guk Lim | 32.1 | 65 | 56 | why do not WUR receiver STA support a WUR PPDU with 20MHz channel width, high data rate, and single stream ? for the efficient transmission, this feature supported on WUR transmitter STA as a mandatory feature should be supported on WUR receiver. | add the following sentence after line 56'WUR PPDU with 20 MHz channel width, High Data Rate, and single stream' | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 243 | Eunsung Park | 32.1 | 65 | 55 | HDR is mandatory at TX but optional at RX. In the conventional 802.11 system, TX and RX have the same mandatory and optional MCS featrures. So, it would be better if WUR uses the same mandatory data rates between TX and RX. Since HDR provides several advantages such as less overhead and higher throughput, it is recommended that HDR is used as a mandatory feature at both TX and RX. | Include a WUR PPDU with 20 MHz channel width, High Data Rate, and single stream as a mandatory feature for a WUR receiver STA. | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 820 | Peter Loc | 4.3.15a | 22 | 3 | To simplify the spec., implementation and operation, Receive 20 MHz WUR PPDU with High Data Rate should be mandatory for WUR non-AP STA. | Delete line 3 "Receive 20 MHz WUR PPDU with High Data Rate." | Rejected.Implementing both LDR and HDR at the WUR non-AP STA is more complex than just implementing the LDR and may increase more power consumption. In order to meet the scope of the project “The WUR has an expected active receiver power consumption of less than one milliwatt,” it is important to develop the amendment such that it does not mandate a mode that increases the power consumption of the WUR non-AP STA. |
| 709 | Minyoung Park | 9.4.2.274 | 33 | 48 | The support for the transmission and reception of a 20 MHz WUR PPDU at HDR (high data rate) should be optional for both the WUR AP and the WUR non-AP STA since it is optional for the WUR non-AP STA. Therefore "Indicate support for the reception of 20 MHz WUR PPDU with HDR." should be replaced by the following "Indicate support for the 20 MHz WUR PPDU at HDR.", and "Set to 1 to indicate support for the reception of 20 MHz WUR PPDU with HDR. Set to 0 otherwise." should be replaced by the following "Set to 1 to indicate support for the 20 MHz WUR PPDU at HDR. Set to 0 otherwise." and delete the following in P33L54 "Reserved for a WUR AP." | As shown in the comment. | Accepted.TGba editor to make the changes shown in doc.: IEEE 802.11-19/0023r1 under all headings that include CID 709. |

* Wake-up radio (WUR) STA

**TGba Editor: *Change the paragraphs below of this subclause in TGba Draft 1.1 as follows (#CID 689):***

A WUR AP has the following mandatory main features:

* Transmit a 20 MHz WUR PPDU with low data rate (LDR).
* (#689)WUR power management procedure.
* WUR wake-up operation.
* WUR duty cycle operation.
* Transmit an unprotected fixed length (FL) WUR Wake-up frame with WUR ID. (#288)
* Transmit an unprotected FL WUR Wake-up frame with transmitter ID. (#288)
* Transmit a WUR Beacon frame.

A WUR AP has the following optional main features:

* Transmit a 20 MHz WUR PPDU with high data rate (HDR).(#689)
* Transmit a 40 MHz WUR PPDU or a 80 MHz WUR PPDU.
* Transmit a 80 MHz preamble punctured WUR PPDU.
* Transmit a variable length (VL) WUR frame. (#288)
* Transmit a protected WUR frame.
* Transmit a WUR Wake-up frame with a group ID.
* Transmit a WUR Discovery frame.Transmit a WUR Vendor Specific frame.
* WUR Capabilities element

**TGba Editor: *Change the Table 9-318a below of this subclause in TGba Draft 1.1 as follows (#CID 709):***

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| * Subfields of the WUR Capabilities Information field
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| Subfield | Definition | Encoding |
| PCR Transition Delay | Indicates the maximum time that the non-AP STA requires to transition its PCR component from the doze state to the awake state.  | The indicated value is equal to 256 × (value of the field plus 1) µs.Reserved for a WUR AP. |
| Frame Body Support | Indicates support for the reception of VL WUR frames. | Set to 1 to indicate support for the reception of VL WUR frames. Set to 0 otherwise.Reserved for a WUR AP. |
| Group IDs Support | Indicates Group IDs support. | Set to 0 to indicate no support for group IDs. Set to 1 to indicate support for up to 16 group IDs. Set to 2 to indicate support for up to 32 group IDs. Set to 3 to indicate support for up to 64 group IDs.(#706)Reserved for a WUR AP. |
| Protection Support | Indicate support for the reception of protected WUR frame. | Set to 1 to indicate support for the reception of protected WUR frame. Set to 0 otherwise.Reserved for a WUR AP. |
| 20 MHz WUR PPDU with HDR Support | Indicate support for the 20 MHz WUR PPDU at HDR.(#709) | Set to 1 to indicate support for the 20 MHz WUR PPDU at HDR. Set to 0 otherwise.(#709)(#709) |
| WUR Channel Switching Support | Indicates whether the WUR channel switching capability for receiving WUR Beacon and WUR Wake-up frames that are transmitted in different channels is enabled or disabled (see 31.9 (WUR FDMA operation)). | Set to 0 if the WUR channel switching capability is supported. Set to 1 if the WUR channel switching capability is not supported. |

* Wake-Up Radio (WUR) PHY specification
* Introduction

**TGba Editor: *Change the Table 9-318a below of this subclause in TGba Draft 1.1 as follows (#CID 689):***

A WUR transmitter STA shall support the following features:

* A WUR PPDU with 20 MHz channel width, low data rate, and single stream.

(#689, 741)

A WUR receiver STA shall support the following features:

* A WUR PPDU with 20 MHz channel width, low data rate, and single stream.

A WUR transmitter STA may support the following features:

* A WUR PPDU with 20 MHz channel width, high data rate, and single stream.(#689, 741)
* FDMA transmissions for 40 MHz and 80 MHz contiguous channel widths.
* FDMA transmission with preamble puncturing for 80 MHz.