### IEEE P802.11Wireless LANs

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| PHY Comment resolution for Clause 31 |
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Abstract

This submission proposes resolutions for comments of TGba Draft D2.0 with the following CIDs: 2063, 2064, 2065, 2066, 2074, 2075, 2076, 2077, 2078, 2079, 2085, 2497, 2500, 2669, 2777, 2789, 2790, and 2826

Note: All the cross-reference is with respect to TGba Draft 2.1

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 2063 | 89.10 | 31.2.4 | Although the actual waveform generation of WUR-sync and WUR-Data fields is implementation dependent, meeting the requirements in WUR transmits specification should be emphasized. | Change "The actual waveform generation of theses fields is implementation dependent." to "The actual waveform generation of these fields is implementation dependent and shall meet all requirements in 31.2.12 WUR transmit specification." | Reject.The requirements specified in Sec. 31.2.12 is for the entire transmit waveform including legacy preamble, WUR-Sync and WUR-Data and not necessarily for the On waveform for WUR-Sync and WUR-Data.  |
| 2064 | 89.35 | 31.2.4 | Delete "An example of a WUR signal generator for the WUR-Sync field is shown in 31-4 An Example of a WUR signal generator for the WUR-Sync field." since it has been mentioned from line 5 to line 11 in that page. | See comment. | Revised. The repetition is removed and now the paragraph reads as “In Figure 31-4 (An Example of a WUR signal generator for the WUR-Sync field), the Sync bit sequence is used to……”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2064. |
| 2065 | 90.44 | 31.2.4.1 | Simplify the sentences from line 44 to line 47 | Change these lines to" The subcarriers with subcarrier indices k = (-6, -4, -2, 2, 4, 6) are used with non-zero input. Other subcarriers are null. | Revised.Agree in principle. The related sentences are modified to accommodate the proposed changes. TGba Editor to make changes as shown in 802.11-19/0398r2 with CID #2065. |
| 2066 | 92.38 | 31.2.4.4 | "Per-antenna" should be "per-transmit chain" | See comment. Several places in the spec draft have "per-antenna". They may need to be fixed. | Revised. “per-antenna” to be replaced with “per-transmit chain” throughout the document.TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2066. |
| 2074 | 88.64 | 31.2.4 | An OOK signal could be generated by hardware 0-1 switcher or any software method, e.g. specifical sequence to simulate On waveform and Off waveform, if the signal can meet the waveform criteria. Therefore it's not necessary to limit the spec to any implementation method in specific favor | replace with "The WUR-Sync field generation may use an On waveform generator (On-WG) and an Off waveform generator (Off-WG)." And modify relative description to make it an exmaple of a possible implementation. | Reject. It is good to have one clear way of generating the WUR-Sync field in the spec. Later in Sec 31.2.4, it is mentioned that the proposed method is one example way of generating the WUR-Sync field. |
| 2075 | 89.1 | 31.2.4 | An OOK signal could be generated by hardware 0-1 switcher or any software method, e.g. specifical sequence to simulate On waveform and Off waveform, if the signal can meet the waveform criteria. Therefore it's not necessary to limit the spec to any implementation method in specific favor | replace with "The WUR-Sync field generation may use an On waveform generator (On-WG) and an Off waveform generator (Off-WG)." And modify relative description to make it an exmaple of a possible implementation. | Reject. It is good to have one clear way of generating the WUR-Data field in the spec. Later in Sec 31.2.4, it is mentioned that the proposed method is one example way of generating the WUR-Data field.Also, the comment and the proposed change is repetition of CID 2074, and does not align with the specified page and line number |
| 2076 | 90.40 | 31.2.4.1 | It's strange to describe how a signal is constructed in a block diagram section. And "2us MC-OOK" is not defined anywhere before. | Move this paragraph to sub-clause 31.2.5 Overview of the PPDU encoding. Or add a new sub-clause to explain MC-OOK | Revised. Agree in principle. Replace “2us MC-OOK” with “2 μs duration MC-OOK” throughout the draft and add the following MC-OOK definition in sub-clause 31.1 Introduction: “For a WUR PPDU with 20 MHz channel width, the WUR-Sync and WUR-Data fields are generated by Multicarrier On-Off Keying (MC-OOK), which uses contiguous 13 subcarriers with a subcarrier spacing of 312.5 kHz and the center subcarrier being null.”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2076. |
| 2077 | 90.64 | 31.2.4.1 | It's strange to describe how a signal is constructed in a block diagram section. And "2us MC-OOK" is not defined anywhere before. | Move this paragraph to sub-clause 31.2.5 Overview of the PPDU encoding. Or add a new sub-clause to explain MC-OOK | Revised. Replace “2us MC-OOK” with “2 µs duration MC-OOK” throughout the draft and add the following MC-OOK definition in sub-clause 31.1 Introduction: “For a WUR PPDU with 20 MHz channel width, the WUR-Sync and WUR-Data fields are generated by Multicarrier On-Off Keying (MC-OOK), which uses contiguous 13 subcarriers with a subcarrier spacing of 312.5 kHz and the center subcarrier being null.”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2077. |
| 2078 | 91.25 | 31.2.4.2 | It's strange to describe how a signal is constructed in a block diagram section. And "4us MC-OOK" is not defined anywhere before. | Move this paragraph to sub-clause 31.2.5 Overview of the PPDU encoding. Or add a new sub-clause to explain MC-OOK | Revised. Replace “4us MC-OOK” with “4 μs duration MC-OOK” throughout the draft and add the following MC-OOK definition in sub-clause 31.1 Introduction: “For a WUR PPDU with 20 MHz channel width, the WUR-Sync and WUR-Data fields are generated by Multicarrier On-Off Keying (MC-OOK), which uses contiguous 13 subcarriers with a subcarrier spacing of 312.5 kHz and the center subcarrier being null.”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2078. |
| 2079 | 91.43 | 31.2.4.2 | It's strange to describe how a signal is constructed in a block diagram section. And "4us MC-OOK" is not defined anywhere before. | Move this paragraph to sub-clause 31.2.5 Overview of the PPDU encoding. Or add a new sub-clause to explain MC-OOK | Revised. Replace “4us MC-OOK” with “4 μs duration MC-OOK” throughout the draft and add the following MC-OOK definition in sub-clause 31.1 Introduction: “For a WUR PPDU with 20 MHz channel width, the WUR-Sync and WUR-Data fields are generated by Multicarrier On-Off Keying (MC-OOK), which uses contiguous 13 subcarriers with a subcarrier spacing of 312.5 kHz and the center subcarrier being null.”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2079. |
| 2085 | 86.51 | 31.2.1 | Since 'BPSK-Mark' field is actually the repeat of L-SIG and it's identified by 11ax devices as 'RL-SIG' field, it's better to change 'BPSK-Mark' to 'RL-SIG'. | Change 'BPSK-Mark' to 'RL-SIG' in the whole standard | Reject.While the content is the same for both BPSK-Mark and RL-SIG, the physical waveform is different for RL-SIG and BPSK-Mark. RL-SIG uses 4 additional tones (56 tones) when compared to BPSK-Mark (52 tones). Although BPSK-Mark is same as L-SIG, renaming it to RL-SIG will create ambiguity with RL-SIG used in HE PHY (802.11ax). |
| 2497 | 92.65 | 31.2.4.4 | The sentence "A cyclic shift, corresponding to that value, is then applied to the waveform." is the only sentence in the paragraph. It is not clear what "that value" and "the waveform" are. | Specify "that value" and "the waveform" in the sentence. | Revised.The corresponding sentence has been modified as “The cyclic shift value, obtained from the lookup table, is applied to the input waveform.”TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2497. |
| 2500 | 90.16 | 31.2.4.1 | The Sync sequences are predefined. There is no need to use "Generation" in the diagram. | Change "Sequence Generation" box to Text "Sync Sequence". | Revised. The block diagram in Figure 31-6 is applicable for WUR-Sync and WUR-Data fields. Added a sentence to clarify that for the WUR-Data field, Sequence generation is required to generate WUR encoded bits.TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2500. |
| 2669 | 95.8 | 31.2.5.5 | Multiple frequency segments not supported. Replace "Apply CSD for each transmit chain and frequency segment" with "Apply CSD for each transmit chain" | As shown in the comment | Accept.This comment is already incorporated in Draft 2.1. |
| 2777 | 127.9 | AB | Regarding CID 1155,The resolution is "REJECTED (MAC: 2018-11-17 13:41:59Z) - The group has agreed to provide 3 examples for each data rate."Please provide more appropriate reason why the group decided to have 3 examples. | As in comment. | Reject.The three examples are optimized for different metrics (For e.x. PAPR and PER performance in different channel conditions) and it is already explained in Annex AB. |
| 2789 | 90.44 | 31.2.4.1 | P90L44 says subcarriers -5, -3, -1, 0, 1, 3, 5 are used. Then, P90L47 says these subcarriers are null.Similar comment onP91L28 and P91L31. | At P90L44, change "Thirteen subcarriers with subcarrier indices k=(-6, -5, ..., -1, 0, 1, 2, ..., 6) are used." to "Six subcarriers with subcarrier indices k=(-6, -4, -2, 2, 4, 6) are used." And delete P90L47. Similar change to P91L38 and P91L31. | Revised.Agree in principle. The related sentences are modified to accommodate the proposed changes. TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2789. |
| 2790 | 90.58 | 31.2.4.1 | If the receiver is going to primarily measure power level, and not perform FFT on the receive waveform, what is the point of having a cyclic prefix? | Please clarify why a cyclic prefix is needed. | Reject. This is invalid comment based on the comment resolution guide 11/1625r2. Asking question is not a valid comment.This design enables AP to reuse existing OFDM PHY transmission blocks for WUR packet generation. |
| 2826 | 111.32 | 31.2.14 | The "TX Data" block shouldn't be in Figure 31-13, because "TX Data" block in the legacy PHY profiles is used for transmitting the 16-bit service field, but we don't have the 16-bit service field in a WUR PPDU. | Remove the "TX Data" block from Figure 31-13. | Revised.TX Data block has been removed as suggested.TGba Editor makes changes as shown in 802.11-19/0398r2 with CID #2826. |

***TGba editor: Change the following paragraphs in 31.2.4 Transmitter block diagram: (Track change on) (#2064)***

…………………………………….(several lines of text)…………………………………………..

Figure 31-4 (An example of a WUR signal generator for the WUR-Sync field), Figure 31-5 (An example of a WUR signal generator for the WUR-Data field), and 31.2.4.1 (WUR PPDU waveform generation for WUR-Sync field and high data rate WUR-Data field) through 31.2.4.4 (Symbol Randomizer and Per-antenna Cyclic Shift) show an example of transmitter block diagram for the WUR-Sync field and the WUR-Data field. The actual waveform generation of these fields is implementation dependent. The waveform generation for L-STF, L-LTF, and L-SIG fields is described in 21.3.3 (Transmitter block diagram).

In Figure 31-4 (An example of a WUR signal generator for the WUR-Sync field), the Sync bit sequence is used to switch between the On-WG and the Off-WG. (#2064)…………………………………….(several lines of text)…………………………………………..

***TGba editor: Change the following paragraphs in 31.2.4.1 WUR PPDU waveform generation for WUR-Sync field and high data rate WUR-Data field: (Track change on) (#2065, 2500, 2789)***

…………………………………….(several lines of text)…………………………………………..

For the WUR-Data field, the sequence generation block generates the WUR encoded bits. For the WUR-Sync field, the sequence generation block outputs the WUR-Sync sequence. (#2500)

For a single 20 MHz WUR channel, the 2 µs MC-OOK On symbol can be constructed by the On-WG using center 13 subcarriers of a 64-point IDFT, sampling at 20 MHz as follows:

* The six subcarriers with subcarrier indices *k* = (-6, -4, -2, 2, 4, 6) are used with non-zero input. Other subcarriers are null. (#1050, #1198, #1199)

 (#2065, 2789)…………………………………….(several lines of text)…………………………………………..

***TGba editor: Change the following paragraphs in 31.2.4.2 WUR PPDU waveform generation for low data rate WUR-Data field: (Track change on) (#2789)***

…………………………………….(several lines of text)…………………………………………..

For a single 20 MHz WUR channel the 4 µs MC-OOK On symbol can be constructed by the On-WG using center 13 subcarriers of a 64-point IDFT, sampling at 20 MHz as follows:

* The 12 subcarriers with subcarrier indices *k* = (-6, -5, … -1, 1, 2, … 6) are used with non-zero input. Other subcarriers are null. (#1051, #1202, #1199)

…………………………………….(several lines of text)…………………………………………..

***TGba editor: Replace “per-antenna” with “per-transmit chain” throughout the draft and replace “Number of Transmit Antennas” with “Number of Transmit Chains” in Tables AB-3 and AB-4 (#2066)***

***TGba editor: Replace “2 μs MC-OOK” with “2 μs duration MC-OOK” and “4 μs MC-OOK” with “4 μs duration MC-OOK”throughout the draft (#2076, 2077, 2078, 2079)***

***TGba editor: Change the following paragraphs in 31.1 Introduction: (Track change on) (#2076, 2077, 2078, 2079, 2104)***

…………………………………….(several lines of text)…………………………………………..

The WUR PHY provides support for 20 MHz and optionally 40 MHz and 80 MHz contiguous channel widths depending on the frequency band and capability. For the channel width equal to 80 MHz, the WUR PHY may support subchannel puncturing transmission where one or more of the non-primary WUR 20 MHz channels are zeroed out.

For a WUR PPDU with 20 MHz channel width, the WUR-Sync and WUR-Data fields are generated by Multicarrier On-Off Keying (MC-OOK), which uses contiguous 13 subcarriers with a subcarrier spacing of 312.5 kHz and the center subcarrier being null.

 (#549)

The WUR PHY uses the Multicarrier On-Off Keying (MC-OOK) modulation, and the coefficients of WUR PHY subcarriers may take values from the BPSK, QPSK, 16-QAM, 64-QAM, or 256-QAM constellation symbols.

…………………………………….(several lines of text)…………………………………………..

***TGba editor: Change the following paragraphs in 31.2.4.4 Symbol Randomizer and Per-antenna Cyclic Shift: (Track change on) (#2497)***

…………………………………….(several lines of text)…………………………………………..

The cyclic shift value, obtained from the lookup table, is applied to the input waveform.

Then the per-antenna cyclic shift is applied to the input waveform. Example values of such cyclic shift diversity are provided in Annex AB.

…………………………………….(several lines of text)…………………………………………..

***TGba editor: Replace Figure 31-13 PHY transmit state machine with the figure below (#2826)***

