### IEEE P802.11Wireless LANs

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| PHY Comment resolution for Clause 32 |
| Date: 2019-01-07 |
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Abstract

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

548, 549, 949, 950, 182, 934, 1193, 742, 935, 952, 953, 954, 955, 766, 768, 919, 1044, 1048, 1195, 1196, 1197, 223, 253, ~~743~~, ~~745~~, 1050, 1198, 1200, 224, 254, 561, ~~744~~, ~~746~~, 956, 1051, 1201, 1202, 1052, 1053, 1203, 1204, 562, 658, 659, 660, 661, 662, 963, 445, 750, 966, 975, 976

Rev 2: CIDs 743, 744, 745, 746 and associated resolutions are excluded from this document.

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| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 548 | 65.33 | 32.1 | typo? | replace "code" with "coding" | Revised.“Manchester code” has been replaced with “Manchester coding”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 549 | 65.37 | 32.1 | typo? | replace "40 MHz, 80 MHz" with "40 MHz and 80 MHz" | Accept.   |
| 949 | 65.00 | 32.1 | Spatial multiplexing is not supported in this standard, so there is no need to refer to "a single stream" | Remove "and single stream" in the three cases in this clause | Reject. No harm in excplicitly stating single stream. Infact, it provides more clarity, as the spec supports WUR transmission with multiple antennas. |
| 950 | 65.54 | 32.1 | There is a sentence saying that the receiver shall receive the LDR, but no sentence saying that the receiver may received the HDR | Add the following text "The WUR receiver STA may support the following: A WUR PPDU with 20 MHz channel width, High Data Rate" | Revised.Added the following supporting text:“A WUR receiver STA may support the following features:— A WUR PPDU with 20 MHz channel width, High Data Rate, and single stream”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 182 | 66.41 | 32.1.2 | Should change the condition to Format is WUR or WUR-FDMA. Need to make samilar changes to many other Tx/Rx vectors too. | as in the comment | Revised.Updated the table 32-1 with a separate row for WUR\_FDMA format. TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 934 |  | 32.2.1 | In "During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble and WUR-Sync field to create the WUR PPDU", BPSK-Mark is missing. | Change the sentence to "During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble, a BPSK-Mark and WUR-Sync field to create the WUR PPDU." | Revised.The corresponding sentence has been updated as follows:“During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble, BPSK-Mark, and WUR-Sync field to create the WUR PPDU”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1193 | 67.64 | 32.2.2 | add BPSK-Mark. For example, it could be "During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble, BPSK-Mark field and WUR-Sync field to create the WUR PPDU.". If legacy preamble includes BPSK-Mark field, it needs to be mentioned. But given P78L56, the legacy preamble fields consisting of (L-STF, L-LTF and L-SIG) | as in comment | Revised.The corresponding sentence has been updated as follows:“During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble, BPSK-Mark, and WUR-Sync field to create the WUR PPDU”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 742 | 68.43 | 32.2.2 | "can" is not a normative text in the following sentence and "rate" should be clarified as "data rate":"The WUR-Sync field can either be 64 µs or 128 µs long and is determined by the rate of the WUR-Data field."Replace the sentence with the following:"The WUR-Sync field is either 64 µs or 128 µs long and is determined by the data rate of the WUR-Data field." | As shown in the comment. | Revised. The corresponding sentence has been rephrased as“The WUR-Sync field is either 64 µs or 128 µs long and is determined by the rate of WUR-Data.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 935 | 68.43 | 32.2.2 | "the rate of the WUR-Data field" doesn't make sense. It should be just "the rate of WUR data". | see comment. | Reject. The sentence is clear enough. The ‘rate’ term applies to WUR-Data field.  |
| 952 | 68.07 | 32.2.2 | The sentence "A single PPDU format is defined for this PHY: the WUR PPDU format" is not correct since we also have the "WUR FDMA PPDU" format | Correct the statement to cover both the WUR and the WUR FDMA formats. | Revised.The corresponding sentence has been rephrased as “The WUR PPDU format is defined for the 20 MHz channel bandwidth.” Added separate subclause for WUR FDMA PPDU format.TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 953 | 68.49 | 32.2.2 | The draft uses "WUR FDMA PPDU" not "FDMA WUR PPDU" | Change "FDMA WUR PPDU" to "WUR FDMA PPDU" | Accept. |
| 954 | 69.18 | 32.2.2 | The draft uses "WUR FDMA PPDU" not "FDMA WUR PPDU" | Change "FDMA WUR PPDU" to "WUR FDMA PPDU" | Accept. |
| 955 | 69.29 | 32.2.2 | Poor wording | Change "the padding" to "then padding" | Accept. |
| 766 | 69.00 | 32.2.3 | The statement in the first paragraph of 32.2.3 is not complete and inaccurate. For example, for Sync field, there is no "Manchester-based encoder". | Remove the original paragraph and replace it by the following:"WUR transmitter block diagram can consist of On waveform generator and Off waveform generator to generate OOK waveform used in WUR-Sync and WUR-Data" | Revised.The first paragraph has been rephrased as follows: “The WUR-Sync field generation uses On waveform generator (On-WG) and Off waveform generator (Off-WG). The WUR-Data field generation uses On-WG, Off-WG and Manchester-based encoder.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 768 | 70.00 | 32.2.3 | The rate of switch should be described and T\_{sym} should be referred to Table 32-3 | Change "switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG)." to "switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG) at rate of 1/T\_sym where T\_{sym} is defined in Table 32-3". | Reject.The switching between On-WG and Off-WG does not happen at a rate 1/*TSym*. The sync bit sequence and duration captures the rate at which the switching happens. |
| 919 | 69.37 | 32.2.3 | "The generation of each field in a WUR-PPDU ...", the description is not accurate, since only WUR-Sync and WUR-Data will use the two new blocks. | Change to "The generation of each 4MHz WUR field in a WUR-PPDU ...", | Revised.The first paragraph has been rephrased as follows: “The WUR-Sync field generation uses On waveform generator (On-WG) and Off waveform generator (Off-WG). The WUR-Data field generation uses On-WG, Off-WG and Manchester-based encoder.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1044 | 69.40 | 32.2.3 | The following statement is not accurate:"The generation of each field in a WUR-PPDU uses the following blocks:-- Manchester-based encoder-- Waveform signal generation"The generation of L-STF, L-LTF, L-SIG, BPSK-Mark does not use either of the two blocks. Generation of WUR-Sync Uses Waveform signal generation block alone and generation of WUR-Data uses both the blocks. | Replace the sentence "The generation of each field in a WUR-PPDU uses the following blocks:-- Manchester-based encoder-- Waveform signal generation" with the following:The generation of WUR-Sync field of WUR-PPDU uses Waveform generation block and the generation of WUR-Data field of WUR-PPDU uses Waveform generation and Manchester-based encoder blocks. | Revised.The first paragraph has been rephrased as follows: “The WUR-Sync field generation uses On waveform generator (On-WG) and Off waveform generator (Off-WG). The WUR-Data field generation uses On-WG, Off-WG and Manchester-based encoder.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1048 | 70.45 | 32.2.3 | The following sentence is confusing: "The information bits are mapped by a Manchester-based encoder." It is not clear what the information bits are mapped to.Rephrase the sentence as follows: "The information bits are mapped to coded bits by a Manchester-based encoder." | As shown in the comment. | Accept. |
| 1195 | 69.36 | 32.2.3 | In "The generation of each field in a WUR-PPDU uses the following blocks:", "each field" in a WUR-PPDU includes legacy field and BPSK-Mark field as well. To fix this misunderstanding, for example, it could be "The generation of WUR signal in a WUR-PPDU uses the following blocks:" | as in comment | Revised.The first paragraph has been rephrased as follows: “The WUR-Sync field generation uses On waveform generator (On-WG) and Off waveform generator (Off-WG). The WUR-Data field generation uses On-WG, Off-WG and Manchester-based encoder.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1196 | 69.45 | 32.2.3 | In 21.3.3, there is no transmitter block diagrams for L-STF and L-LTF. Delete L-STF and L-LTF | as in comment | Revised.The related sentence has been rephrased as “The transmit waveform generation for L-STF, L-LTF and L-SIG fields is described in 21.3.3.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1197 | 70.30 | 32.2.3 | In order to match Figure 32-5 with its description, add " Information bits"of text in front of Manchester- based encoder block | as in comment | Accept. |
| 223 | 71.20 | 32.2.3.1 | Specify CSD Insertion on figure 32-6 | see the comment. | Reject.CSD insertion is already captured inside Symbol Randomizer step. |
| 253 | 71.34 | 32.2.3.1 | 1024 QAM was adopted as an optional feature in 11ax, and thus, WUR can also consider supporting it. | Add 1024-QAM for the candidate of constellation. | Reject.There is no proven advantage of using 1024 QAM.  |
| 743 | 71.28 | 32.2.3.1 | "can" is not a normative text in the following sentence and there is no single occurance in the baseline standard:"For a single 20-MHz WUR channel, the 2 µs MC-OOK On symbol can be constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:"Replace "can be" to "is" and replace the sentence with the following:"For a single 20-MHz WUR channel, the 2 µs MC-OOK On symbol is constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:" | As shown in the comment. | Accept. |
| 745 | 71.44 | 32.2.3.1 | "can" is not a normative text in the following sentence and there is no single occurance in the baseline standard:"For a single 20-MHz WUR channel, the 2 µs MC-OOK Off symbol can be constructed by the Off-Waveform Generator (Off-WG) as zero for 2 µs."Replace "can be" to "is" and replace the sentence with the following:"For a single 20-MHz WUR channel, the 2 µs MC-OOK Off symbol is constructed by the Off-Waveform Generator (Off-WG) as zero for 2 µs." | As shown in the comment. | Accept. |
| 1050 | 71.31 | 32.2.3.1 | The following sentence is confusing. "Thirteen subcarriers are used, (-6, -5, ... -1, 0, 1, 2, ... 6)." It is not clear what values are used for the remaining 51 subcarriers.It should be explicitly mentioned that the other subcarriers are zero. Rephrase the sentence as follows: "Thirteen subcarriers are used, (-6, -5, ... -1, 0, 1, 2, ... 6). Other subcarriers are null." | As shown in the comment. | Revised. The corresponding sentence has been rephrased as “Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used.. Other subcarriers are null.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1198 | 71.31 | 32.2.3.1 | use subcarrier "indices" with math symbol by using k instead of (-6, ... 6). | as in comment | Revised. The corresponding sentence has been rephrased as “Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used.. Other subcarriers are null.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1200 | 71.38 | 32.2.3.1 | add reference (32.2.3.4 Symbol Randomizer) at the end of the sentence | as in comment | Revised. Added the reference 32.2.3.4 for symbol randomizer.TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 224 | 72.18 | 32.2.3.2 | Specify CSD Insertion on figure 32-7 | see the comment. | Reject.CSD insertion is already captured inside Symbol Randomizer step. |
| 254 | 72.34 | 32.2.3.2 | 1024 QAM was adopted as an optional feature in 11ax, and thus, WUR can also consider supporting it. | Add 1024-QAM for the candidate of constellation. | Reject.There is no proven advantage of using 1024 QAM.  |
| 561 | 73.30 | 32.2.3.2 | Inconsistency | remove the word "based" | Revised. “Multicarrier based OOK (MC-OOK)” is replaced with “MC-OOK”. MC-OOK is already defined in 3.4 as “Multicarrier On-Off Keying”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 744 | 72.27 | 32.2.3.2 | "can" is not a normative text in the following sentence and there is no single occurance in the baseline standard:"For a single 20-MHz WUR channel the 4 µs MC-OOK On symbol can be constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:"Replace "can be" to "is" and replace the sentence with the following:"For a single 20-MHz WUR channel the 4 µs MC-OOK On symbol is constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:" | As shown in the comment. | Accept. |
| 746 | 72.42 | 32.2.3.2 | "can" is not a normative text in the following sentence and there is no single occurance in the baseline standard:"For a single 20-MHz WUR channel the 4 µs MC-OOK Off symbol can be constructed by the Off-Waveform Generator (Off-WG) as zero for 4 µs."Replace "can be" to "is" and replace the sentence with the following:"For a single 20-MHz WUR channel the 4 µs MC-OOK Off symbol is constructed by the Off-Waveform Generator (Off-WG) as zero for 4 µs." | As shown in the comment. | Aceept. |
| 956 | 73.33 | 32.2.3.2 | Improper word ordering | Change "FDMA WUR PPDU" to "WUR FDMA PPDU" | Accept. |
| 1051 | 72.31 | 32.2.3.2 | The following sentence is confusing. "Thirteen subcarriers are used, (-6, -5, ... -1, 0, 1, 2, ... 6)." It is not clear what values are used for the remaining 51 subcarriers.It should be explicitly mentioned that the other subcarriers are zero. Rephrase the sentence as follows: "Thirteen subcarriers are used, (-6, -5, ... -1, 0, 1, 2, ... 6). Other subcarriers are null." | As shown in the comment. | Revised. The corresponding sentence has been rephrased as “Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used.. Other subcarriers are null.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1201 | 72.36 | 32.2.3.2 | add reference (32.2.3.4 Symbol Randomizer) at the end of the sentence | as in comment | Revised. Added the reference 32.2.3.4 for symbol randomizer.TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1202 | 72.30 | 32.2.3.2 | use subcarrier "indices" with math symbol by using k instead of (-6, ... 6). | as in comment | Revised. The corresponding sentence has been rephrased as “Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used.. Other subcarriers are null.”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1052 | 73.15 | 32.2.3.3 | "In Fig. 32-8, Same T\_{Sym} is used for different channels. But T\_{Sym} will be different for channels with LDR and for channels with HDR.Use different T\_{Sym}, for different subchannels." | As shown in the comment. | Revised. The figure 32-8 has been updated to incorporate the comment. Below the switch, we specify the subchannel numberTGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1053 | 73.15 | 32.2.3.3 | "Fig. 32-8 shows that window function is applied after adding the baseband signals. However, window fucntion will be different for channels with different WUR\_DATARATE.Update the figure 32-8 to show window operation on each channel, and interchange the order of window and adder." | As shown in the comment. | Revised. The figure 32-8 has been updated to incorporate the comment. Window is now applied for each of subchannel separately.TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1203 | 73.30 | 32.2.3.3 | mutlicarrer on-off keying at P73L30 or multicarreier based on-off keying at P83 L4? Use unified term for MC-OOK | as in comment | Revised. “Multicarrier based OOK (MC-OOK)” is replaced with “MC-OOK”TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 1204 | 73.32 | 32.2.3.3 | WUR\_DATARATE -> WUR\_TXVECTOR parameter WUR\_DATARATE | as in comment | Reject. It is understood that it is a WUR\_TXVECTOR parameter from Table 32-1, and the usage is consistent with usage of other parameters.  |
| 562 | 76.09 | 32.2.4 | missing aymbol? | says k(0,1,....,K-1). Seems the mathematical symbol for belongs to is missing between k and ( | Revised.TGba Editor makes changes as shown in 802.11-19/0053r1 |
| 658 | 76.59 | 32.2.6 | The Description column of Table 32-3 reads "Duration of WUR HDR OOK symbol in WUR-Data field". This terminology is inconsistent with the terminology used in Tables 32-10 and 32-11. | Change the text in the column labeled Description to "Duration of WUR HDR MC-OOK symbol in WUR-Data field" | Revised.The comment has been incorporated in TGba D1.1. |
| 659 | 76.62 | 32.2.6 | The Description column of Table 32-3 reads "Duration of OOK symbol in WUR-Data field". This terminology is inconsistent with the terminology used in Tables 32-10 and 32-11. | Change the text in the column labeled Description to "Duration of MC-OOK symbol in WUR-Data field" | Revised.The comment has been incorporated in TGba D1.1. |
| 660 | 76.65 | 32.2.6 | The Description column of Table 32-3 reads "Duration of OOK symbol in WUR-Sync field". This terminology is inconsistent with the terminology used in Tables 32-10 and 32-11. | Change the text in the column labeled Description to "Duration of MC-OOK symbol in WUR-Sync field" | Revised.The comment has been incorporated in TGba D1.1. |
| 661 | 77.29 | 32.2.6 | The Explanation column of Table 32-4 reads "Number of OOK symbols per information data bit". This terminology is inconsistent with the terminology used in Tables 32-10 and 32-11. | Change the text in the column labeled Explanation to "Number of MC-OOK symbols per information data bit" | Revised.The comment has been incorporated in TGba D1.1. |
| 662 | 77.35 | 32.2.6 | The Explanation column of Table 32-4 reads "Number of OOK symbols in the WUR-SYNC field". This terminology is inconsistent with the terminology used in Tables 32-10 and 32-11. | Change the text in the column labeled Explanation to "Number of MC-OOK symbols in the WUR-SYNC field" | Revised.The comment has been incorporated in TGba D1.1. |
| 963 | 77.00 | 32.2.6 | I think it would be good to specify "MC-OOK" versus "OOK" in Table 32-4. | Change "OOK" to "MC-OOK" in the two locations in the table. | Revised.The comment has been incorporated in TGba D1.1. |
| 445 | 80.00 | 32.2.8.1 | "The data rate of the WUR-Data field of a WUR PPDU will be indicated using the WUR-Sync field. There will not be an explicit field in a WUR PPDU to indicate the data rate." Change "will be" to "is", change "will not be" to "is no". | As in comment | Accept. |
| 750 | 80.56 | 32.2.8.1 | """will be"" is not a normative text in the following setence:""The data rate of the WUR-Data field of a WUR PPDU will be indicated using the WUR-Sync field.""Replace ""will be"" to ""is"" and replace the sentence with the following:""The data rate of the WUR-Data field of a WUR PPDU is indicated using the WUR-Sync field.""" | As shown in the comment. | Accept. |
| 966 | 80.57 | 32.2.8.1 | Poor wording | Change "There will not be an explicit field..." to "There is no explicit field" | Accept. |
| 975 | 93.12 | 32.3.1 | I believe the maximum PPDU duration is 2968 us. My calculation is 24 + 128 + (22 \* 8 \* 16) | Change "2986" to "2968" | Accept. |
| 976 | 93.24 | 32.4 | We do not use "MCS" in the draft | Change "WUR-MCSs" to "WUR Data Rates" | Accept. |

***TGba editor: Change the following paragraphs in 32.1 Introduction as follows: (Track change on) (#548, #549, #950)***

**32.1 Introduction**……………………………… (Several lines of text) ………………………………

The Wake-up Radio PHY provides support for Manchester coding, which shall be applied to all data rates for the WUR-Data field.(#548)

The Wake-up Radio PHY provides support for 20MHz and optionally 40MHz and 80 MHz continuous channel widths depending on the frequency band and capability. For channel widths equal to 80MHz, the Wake-up PHY may support preamble puncturing transmission where one or more of the non-primary WUR 20MHz channels are zeroed out. (#549)

……………………………… (Several lines of text) ………………………………

……………………………… (Several lines of text) ………………………………

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 non-AP STA may support the following features:
— A WUR PPDU with 20 MHz channel width, High Data Rate, and single stream(#950)

……………………………… (Several lines of text) ………………………………

***TGba editor: Update the row corresponding to ‘L\_LENGTH’ parameter in Table*** ***32-1 (WUR\_TXVECTOR and WUR\_RXVECTOR parameter) as follows in TGba Draft 1.0: (Track change on) (#182)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| L\_LENGTH | FORMAT is WUR | Not present.NOTE—the length field of the L-SIG in WUR PPDU is defined in Equation (32-10) using the TXTIME value defined by Equation (32-7).  | Y | N |
| FORMAT is WUR\_FDMA | Not present.NOTE—the length field of the L-SIG in WUR FDMA PPDU is defined in Equation (32-10) using the TXTIME value defined by Equation (32-11).  |
| Otherwise | See corresponding entry in Table 19-1 (TXVECTOR and RXVECTOR parameters) or Table 21-1 (TXVECTOR and RXVECTOR parameters). |

***TGba editor: Change the following paragraphs in 32.2.1 Introduction as follows: (Track change on)*** (#934,#1193)

**32.1 Introduction**……………………………… (Several lines of text) ………………………………

During transmission, a PSDU is processed and appended to the PHY preamble including legacy preamble, BPSK-Mark, and WUR-Sync field to create the WUR PPDU. At the legacy receivers, the legacy preamble is accordingly processed to aid in protection of the WUR PSDU. At the wake-up receiver, the WUR-Sync field is accordingly processed to aid in the detection, demodulation, and delivery of the PSDU. (#934,#1193)

***TGba editor: Change the following paragraphs in 32.2.2 WUR PPDU format as follows: (Track change on)*** (#742, #952, #953, #954, #955)

**32.2.2 WUR PPDU format**

The WUR PPDU format is defined for the 20 MHz channel bandwidth. Figure 32-1 (WUR PPDU format) shows the WUR PPDU format.(#952)……………………………… (Several lines of text) ………………………………

……………………………… (Several lines of text) ………………………………

The WUR-Sync field is either 64 µs or 128 µs long and is determined by the rate of the WUR-Data field.(#742)

**32.2.2a WUR FDMA PPDU format (#952)**

The WUR FDMA PPDUs with 40 MHz and 80 MHz channel bandwidth are defined in Figure 32-2 (WUR FDMA PPDU for 40 MHz channel widths) and Figure 32-3 (WUR FDMA PPDU for 80 MHz channel
widths), respectively.(#953)

For the WUR FDMA PPDUs with 40 MHz and 80 MHz channel bandwidth, different WUR-Sync field
according to the rate of WUR-Data can be applied to each 20 MHz channel.(#954)

The 40 MHz preamble or 80 MHz preamble is the duplication of 20 MHz preamble, which is composed of L-STF, L-LTF, L-SIG and BPSK-Mark fields. In each 20 MHz sub-channel with duplicated 20 MHz preamble, one 4 MHz WUR signal centered in the 20 MHz sub-channel is transmitted following the 20 MHz preamble.

In FDMA transmission, the WUR transmission on each non-punctured 20 MHz sub-channel has equal duration of transmission, and if the duration of WUR transmission on any of the non-punctured 20 MHz subchannels is shorter than L\_LENGTH described in 32.3.1 (TXTIME and PSDU length calculation), then (#955)padding is used to ensure that WUR transmissions on each non-punctured 20 MHz sub-channel always have the length indicated by the LENGTH field in the L-SIG

***TGba editor: Change the following paragraphs in 32.2.3 Transmitter block diagram as follows: (Track change on)*** (#766, #919, #1044, #1048, #1195, #1196)

**32.2.3 Transmitter block diagram**

The WUR-Sync field generation uses the On waveform generator (On-WG) and the Off waveform generator (Off-WG). (#766,#919,#1044,#1195)

The WUR-Data field generation uses the On waveform generator (On-WG), the Off waveform generator (Off-WG) and Manchester-based encoder.

* (#766,#919,#1044,#1195)

Figure 32-4 (An Example of a WUR signal generator for the WUR-Sync field) and Figure 32-5 (An Example of a WUR signal generator for the WUR-Data field) show an example transmitter block diagram for WUR-Sync and WUR-Data fields. The actual waveform generation for these fields is implementation dependent. The transmit waveform generation for L-STF, L-LTF, and L-SIG fields is described in 21.3.3 (Transmitter block diagram). (#1196)

An example of a WUR signal generator for the WUR-Sync field is shown in 32-4 (An Example of a WUR signal generator for the WUR-Sync field). The Sync bit sequence is then used to switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG)

An example of a WUR signal generator for the WUR-Data field is shown in Figure 32-5 (An Example of a WUR signal generator for the WUR-Data field). The information bits are mapped to coded bits by a Manchester-based encoder.(#1048) Each coded bit is then used to switch between the On waveform generator (On-WG) and the Off waveform generator (Off-WG.)

***TGba editor: Replace the Figure 32-4-An Example of a WUR signal generator for the WUR-Sync field with the figure below***



***TGba editor: Replace the Figure 32-5-An Example of a WUR signal generator for the WUR-Data field with the figure below (#1197)***



***TGba editor: Change the text in 32.2.3.1 WUR-PPDU waveform generation for Sync field and high rate Data field as follows: (Track change on)*** ( #1050, #1198, #1200)

**32.2.3.1 WUR-PPDU waveform generation for Sync field and high rate Data field**

For a single 20-MHz WUR channel, the 2 µs MC-OOK On symbol can be constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:

* Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used.(#1198) Other subcarriers are null.(#1050)

— The subcarriers with subcarrier indices (-5, -3, -1, 0, 1, 3, 5) are null. (#1198)

— The non-zero subcarriers are selected from any of the following constellations: BPSK, QPSK, 16-QAM, 64-QAM, and 256-QAM.

— The first 32 values of the 64-point IDFT output are selected.

— Those 32 values are processed by the Symbol Randomizer, as described in 32.2.3.4 (Symbol Randomizer).(#1200)

— The last 8 samples of those 32 samples are prepended to the 32 samples generating 40 sam-ples, representing the MC-OOK 2 µs On symbol. This step corresponds to the GI Insertion in Figure 32-6 (An Example of an On-WG for the Sync and high rate Data fields).

For a single 20-MHz WUR channel, the 2 µs MC-OOK Off symbol can be constructed by the Off-Waveform Generator (Off-WG) as zero for 2 µs.

***TGba editor: Change the text in 32.2.3.2 WUR-PPDU waveform generation for low rate Data field as follows: (Track change on)*** ( #1051, 1201, #1202)

**32.2.3.2 WUR-PPDU waveform generation for low rate Data field**

For a single 20-MHz WUR channel the 4 µs MC-OOK On symbol can be constructed by the On-Waveform Generator (On-WG) using a 64-point IDFT, sampling at 20-MHz as follows:

* Thirteen subcarriers with subcarrier indices (-6, -5, … -1, 0, 1, 2, … 6) are used. Other subcarriers are null.(#1051,#1202)
* The DC subcarrier is null.
* The non-zero subcarriers are selected from any of the following constellations: BPSK, QPSK, 16-QAM, 64-QAM, and 256-QAM.
* The 64 values from the 64-point IDFT are processed by the Symbol Randomizer, as described in 32.2.3.4 (Symbol Randomizer).(#1201)
* The last 16 values of the 64-point IDFT output are prepended to the 64 samples generating 80 samples, representing the 4 µs MC-OOK On symbol. This step corresponds to the GI Insertion in Figure 32-7 (An Example of an On-WG for the low rate Data fields).

For a single 20-MHz WUR channel the 4 µs MC-OOK Off symbol can be constructed by the Off-Waveform Generator (Off-WG) as zero for 4 µs.

***TGba editor: Change the text in 32.2.3.3 WUR-PPDU Data field waveform generation for the FDMA transmission as follows: (Track change on)*** (#561, #956, #1203)

**32.2.3.3 WUR-PPDU Data field waveform generation for the FDMA transmission**

MC-OOK (#561,#1203)‘On’ symbol for 20 MHz WUR waveform can be generated ac-cording to 32.2.3.1 (WUR-PPDU waveform generation for Sync field and high rate Data field) or 32.2.3.2 (WUR-PPDU waveform generation for low rate Data field) depending on WUR\_DATARATE. The 40 MHz or 80 MHz WUR FDMA PPDU (#956)can be generated by multiplexing multiple 20 MHz WUR waveforms in the corresponding channel as shown in Figure 32-8 (An Example of a WUR Data field signal generator for the FDMA transmission).

***TGba editor: Replace the Figure 32-8 (An Example of a WUR Data field signal generator for the FDMA transmission) with the figure below*** (#1052, #1053)



***TGba editor: Change the text in bullet (d) within 32.2.4.8 Construction of the WUR-Sync and WUR-Data for the FDMA transmission as follows: (Track change on)*** (#562)

Waveform generation for the WUR-Data field: The output of the *k*th Manchester based encoder determines which samples to take either from the *k*th HDR On-WG or LDR On-WG of corresponding 20 MHz sub-channel or from Off-WG, depending on the WUR\_BANDWIDTH and the WUR\_DATARATE, where *k* (0≤ *k ≤K-1*) (#562)is the index of the 20 MHz sub-channel. The samples in Off-WG have zero energy. Each symbol duration, *TSym* is 2 μs for high data rate (T*SYM-HDR*) and 4 μs for low data rate (T*SYM-LDR*).

***TGba editor: Change the following text in second paragraph of 32.2.8.1 Introduction as follows: (Track change on)*** (#445, #750, #966)

The data rate of the WUR-Data field of a WUR PPDU is (#445, #750)indicated using the WUR-Sync field. There is no (#966, #445)explicit field in a WUR PPDU to indicate the data rate.

***TGba editor: Change the aPPDUMaxTime Value in Table 32-12 (WUR PPDU Time and Length Characteristics) to 2968 µs (#975)***

***TGba editor: Change the Clause 32.4 section name from “*Parameters for WUR-MCSs*” to “*Parameters for WUR Data Rates*” (#976)***