IEEE P802.11
Wireless LANs

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| CC36 Comment Resolution on U-SIG Part 2 |
| Date: 2021-07-13 |
| Author(s): |
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Abstract

This submission proposes resolutions for the following comments from the CC36 on P802.11be D1.0: Comments in 36.3.12.7.4.

NOTE – Set the Track Changes Viewing Option in the MS Word to “All Markup” to clearly see the proposed text edits.

**Revision History:**

R0: Initial version. Resolve CIDs 4849, 4850, 5003, 5004, 5005, 5413, 5414, 5821, 6800, 6801, 6802, 7208, 7477, 8215.

R1: Revise resolution to CID 5005.

# CID 5413

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 5413 | 36.3.12.7.4 | 424.06 | Remove the comma "," in "rate, R=1/2". | Please refer to my comment. | Accepted |

# CID 7208

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 7208 | 36.3.12.7.4 | 424.13 | "104 complex numbers". This is BPSK, values are +/-1. | Remove "complex" | Revised.Agree with the comment in principle. But it is better to change “complex numbers” or “complex number” to “BPSK modulated symbols” or “BPSK modulated symbol”.Note to editor: Please change “complex numbers” or “complex number” to “BPSK modulated symbols” or “BPSK modulated symbol” in P424L13, P424L14 (2 places), P424L16, P424L19, P425L35, P425L36 (2 places), P425L37. |

# CID 4849, 5003, 5414

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 5414 | 36.3.12.7.4 | 424.19 | Change "80 MHz subblock" to "80 MHz subblock i\_{80FS}. | Please refer to my comment. | Revised.Agree to the comment in principle. The definition of i\_{80FS} was in this sentence in D0.3 and had been deleted by mistake since D0.4. Could add it back according to this comment.Note to editor: Change "80 MHz subblock" to "80 MHz frequency subblock i\_{80FS}. Same resolution to CID 4849, 5003, 5414. |
| 4849 | 36.3.12.7.4 | 424.21 | Add the definition of i\_80FS for equation | As in comment | Revised.Resolution to CID 5414 addresses this CID.Note to editor: same resolution to CID 4849, 5003, 5414.  |
| 5003 | 36.3.12.7.4 | 424.21 | Define i\_80FS. | See the comment. | Revised.Resolution to CID 5414 addresses this CID.Note to editor: same resolution to CID 4849, 5003, 5414. |

# CID 4850, 5004, 5821, 6800

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 4850 | 36.3.12.7.4 | 424.46 | On the right side of the equation, change upper case "D" with low case "d" | As in comment | Accepted.Note to editor: same resolution to CID 4850, 5004, 5821, 6800. Resolution to CID 5004 address this CID. No further change is needed. |
| 5004 | 36.3.12.7.4 | 424.47 | Change D^floor(i\_BW/4)\_M'\_20(k),n to d^floor(i\_BW/4)\_M'\_20(k),n. | See the comment. | Accepted.Note to editor: same resolution to CID 4850, 5004, 5821, 6800. |
| 5821 | 36.3.12.7.4 | 424.46 | In the 2nd row of equation for D\_k,n,i\_BW, "D" should be lower case. | as in the comment | Accepted.Note to editor: same resolution to CID 4850, 5004, 5821, 6800. Resolution to CID 5004 address this CID. No further change is needed. |
| 6800 | 36.3.12.7.4 | 424.47 | The right-hand side of the equation (un-numbered) indicating how modulated data symbols are mapped to the data sub-carriers of U-SIG should have small "d" as opposed to capitalized "D" (where small "d" definition is in lines 19-21 above). | As in comment | Accepted.Note to editor: same resolution to CID 4850, 5004, 5821, 6800. Resolution to CID 5004 address this CID. No further change is needed. |

# CID 5005, 6802, 7477

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 5005 | 36.3.12.7.4 | 426.37 | In Equation (36-22), i\_BW index is not used so change "D\_k,n,i\_BW" to "D\_k,n,0". | See the comment. | Revised.Agree to the comment that the use of index of i\_BW is missing in equation (36-22). Similar to the previous equations (36-20) and (36-21), the index of i\_BW should be used in a summation of i\_BW over a set of non-punctured 20MHz subchannels.Per Motion 137, #SP292, the BW of the EHT ER preamble is not defined and could be any EHT PPDU BW. It is not restricted to 20MHz BW. It’s better to keep the BW option open by keeping the notation of D\_{k,n,i\_BW}, instead of using D\_{k,n,0}.Note to editor: In equation (36-22), add a summation of i\_BW where i\_BW belongs to the set of Omega\_{20MHz}. *Tgbe Editor: Please make changes for CID 5005 as shown in the following document*[*https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx*](https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx) |
| 6802 | 36.3.12.7.4 | 426.41 | Definition for D\_{k,n,i\_BW} is missing for ER-preamble in (36-22) | Suggest to include a defnition, accounting for the phase rotation defined in R\_n | Rejected.Per Motion 137, #SP292, the BW of the EHT ER preamble is not defined and could be any EHT PPDU BW. It is not restricted to 20MHz BW. It’s better to keep the BW option open by keeping the notation of D\_{k,n,i\_BW} in equation (36-22) same as the notation of D\_{k,n,i\_BW} in previous equations (36-20) and (36-21). Therefore, no need to redefine it, and phase rotation is not accounted for in the notation of D\_{k,n,i\_BW}. |
| 7477 | 36.3.12.7.4 | 425.30 | "This process happens on a per-80 MHz subblock basis as U-SIG field may have different contents in different 80 MHz subblocks, while always having identical content in every 20 MHz subchannel of a given 80 MHz subblock." is not needed since ER preamble shall only be used in 20MHz BW. | Remove this sentence | Rejected.Per Motion 137, #SP292, the BW of the EHT ER preamble is not defined and could be any EHT PPDU BW. It is not restricted to 20MHz BW. It’s better to keep the BW option open by keeping this sentence. |

***Instructions to the editor:***

**Please make the changes to P426L30-L39 (i.e., equation (36-22)) as shown below for CID 5005:**

(36-22)

# CID 6801, 8215

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| **CID** | **Clause** | **Page.Line** | **Comment** | **Proposed Change** | **Resolution** |
| 6801 | 36.3.12.7.4 | 424.23 | The current description of ER preamble is confusing and contradictory. First it is said that U-SIG has two parts U-SIG1 and U-SIG2 and that the data bits are BCC encoded and interleaved. Later U-SIG repeated symbols are introduced and it is mentioned that data bits are encoded but not interleaved for these symbols.It would be better to edit as follows:- State clearly up-front that ER preamble has 4 symbols of which two carry repeated content.- limit the initial description upto BCC encoding of 52 data bits to generate 104 coded bits- Next, describe how the above coded bits are interleaved (when needed) and constellation-mapped for each U-SIG symbol (U-SIG-sym1 through U-SIG-sym4) separately. | As in comment | Revised.Agree with the comment in principle that the structure of the paragraph could be improved as suggested. The paragraph is restructured according to the comment to give an overview of the U-SIG symbols of an ER preamble in the beginning, and use better and separate description of the modulation process (after forming the encoded bits) of different OFDM symbols.*Tgbe Editor: Please make changes for CID 6801 as shown in the following document*[*https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx*](https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx) |
| 8215 | 36.3.12.7.4 | 426.15 | U-SIG in ER preamble still has only two OFDM symbols worth of content. Instead of "U-SIG-sym-1/2/3/4", use U-SIG-sym-1, U-SIG-sym-1-R, etc., similar to 11ax (11ax-2021 Figure 27-25) | In Figure 36-35, change"U-SIG-sym-2" to "U-SIG-sym-1-R","U-SIG-sym-3" to "U-SIG-sym-2","U-SIG-sym-4" to "U-SIG-sym-2-R" | Revised.Figure 36-35 and the paragraph above Figure 36-35 are revised according to the proposed change.*Tgbe Editor: Please make changes for CID 8215 as shown in the following document*[*https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx*](https://mentor.ieee.org/802.11/dcn/21/11-21-1146-01-00be-cc36-comment-resolution-on-u-sig-part-2.docx) |

***Instructions to the editor:***

**Please make the changes to P425L23-P426L24 as shown below for CID 6801 and 8215:**

(#1372)(#1373)For an ER preamble, the length of the U-SIG field is four OFDM symbols. The first two OFDM symbols carry same coded bits, and the last two OFDM symbols also carry same coded bits. For better frequency diversity, the encoded bits in the first and thrid OFDM symbols are interleaved, while the encoded bits in the second and fourth OFDM symbols are not interleaved. The constellation mapping of the U-SIG field in an ER preamble is the same as that of the HE-SIG-A field in an HE ER SU PPDU, and is shown in Figure 36-35 (Data subcarrier constellation of U-SIG symbols(#1372)(#1373)). The QBPSK constellation on the data subcarriers in the second OFDM symbol of U-SIG is used to differentiate an ER preamble from an EHT MU PPDU or an EHT TB PPDU. The U-SIG field is composed of two parts, i.e., U-SIG-1 and U-SIG-2, each containing 26 data bits. U-SIG-1 is transmitted before U-SIG-2. The data bits of U-SIG-1 and U-SIG-2 shall be BCC encoded at rate *R* = 1 / 2 to form total 104 encoded bits, following the steps described in 17.3.5.6 (Convolutional encoder). To form the first and third OFDM symbols of U-SIG, the encoded bits are further interleaved, mapped to a BPSK constellation, and have pilots inserted, following the steps described in 27.3.12.8 (BCC interleavers), 17.3.5.8 (Subcarrier modulation mapping), and 17.3.5.9 (Pilot subcarriers), respectively. The first and second half of the stream of 104 BPSK modulated symbols generated by these steps (before pilot insertion) is divided into two groups of 52 BPSK modulated symbols, where respectively, the first 52 BPSK modulated symbols form the first OFDM symbol of U-SIG (denoted as U-SIG-sym-1) and the second 52 BPSK modulated symbols form the third OFDM symbol of U- SIG (denoted as U-SIG-sym-2) for the ER preamble. To form the second OFDM symbol of U-SIG (denoted as U-SIG-sym-1-R) for the ER preamble, the first 52 encoded bits shall be mapped to a QBPSK constellation without interleaving and have pilots inserted following the steps described in 17.3.5.8 (Subcarrier modulation mapping) and 17.3.5.9 (Pilot subcarriers), respectively. To form the fourth OFDM symbol of U-SIG (denoted as U-SIG-sym-2-R) for the ER preamble, the second 52 encoded bits shall be mapped to a BPSK constellation without interleaving and having pilots inserted following the steps described in 17.3.5.8 (Subcarrier modulation mapping) and 17.3.5.9 (Pilot subcarriers), respectively. This process happens on a per-80 MHz frequency subblock basis as U-SIG field may have different contents in different 80 MHz frequency subblocks, while always having identical content in every 20 MHz subchannel of a given 80 MHz frequency subblock.



**Figure 36-35—Data subcarrier constellation of U-SIG symbols**(#1372)(#1373)