IEEE P802.11
Wireless LANs

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| CR for 36.3.13.7 (Constellation Mapping) |
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Abstract

This submission proposes resolutions for the following CIDs:

* 4909, 7248, 8136

# Introduction

This submission proposes resolutions for the following CIDs:

* 4909, 7248, 8136

All CIDs relate to section 36.3.13.7 (Constellation Mapping).

Proposed changes are relative to 802.11be D1.1.

# Proposed resolutions

**CID 7248**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 7248 | 36.3.13.7 | 489.43 | Change "determines the I value" to "determine the I value" and "determines the Q value" to "determine the Q value" | See comment | ACCEPTED |



**CID 4909**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 4909 | 36.3.13.7 | 492.03 | When DCM is used, the value of N\_SD is different from N\_SD without DCM.to make it clear, add the following text. The NSD here refers to half the value of NSD without DCM | As in comment | REVISED.Agree in principle. Instead of the proposed resolution, it appears better to refer directly to Tables 36-70 to 36-85 and Table 36-86 for the correct N\_SD value to be used with DCM, rather than defining it as half of some other value.A similar clarification needs to be made for the value of N\_CBPS,u. Editor’s instruction: implement text changes as shown in the section “Text Proposal” of 802.11-21/1537r0. |



**CID 8136**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 8136 | 36.3.13.7 | 492.09 | the third paragraph at P492. this is for a 996-tone RU or smaller. Additional description for larger tone RU should be added. Refer to the corresponding subclause in 11ax specificaion | as in comment | REVISED.Agree in principle, but additional changes are needed to cover the MRU case.Editor’s instruction: implement text changes as shown in the section “Text Proposal” of 802.11-21/1537r0. |

**Discussion**

As pointed out in CID 8136, the text below describes only a single RU (<= 996 tones):



In addition, D1.1, page 492, line 6 also states:



How this is done is not explained in detail however. By contrast, 802.11ax-2021 contains the following text:



This makes it clear(er) how processing is done for BW > 80 MHz. However, even this text does not adequately cover the case of EHT for the following reasons:

1. D1.1 never describes how DCM is to be performed for MRUs
2. 802.11ax-2021 only deals with full-bandwidth 80 MHz and 160 MHz, while 802.11be covers both punctured cases and bandwidths up to 320 MHz.

Changes that are needed in 36.3.13.7 are:

1. Clean up description of single RU <= 996 tones (see CID 4909)
2. Add description of DCM for MRUs < 996 tones
3. Add description of how to perform DCM per 80 MHz subblock for wider bandwidths

The changes are shown in the Text proposal below.

# Text proposal

Editor’s instruction: change text in 802.11be D1.0 starting on page 541, line 60 as shown below.

DCM is a modulation scheme that is applied to EHT-MCSs 14 and 15. It only applies to BPSK and *NSS* = 1.

~~If~~ When DCM is employed for a 996-tone or smaller RU, bit sequences are mapped to ~~a~~ pairs of symbols *d*'*k* *d*'*q**k* where *k* is in the range of 0  *k*  *NSD* – 1 and *q**k* is in the range of *NSD*  *k*  2*NSD* – 1 . For RUs equal to or smaller than 996 tones, *q**k* = *k* + *NSD.* *NSD* values for use with DCM are given for each RU in the Table 36-70 to Table 36-85 for MCS 15 and in Table 36-86 for MCS 14.

~~For larger RU sizes, DCM is performed within each 80 MHz subblock(#1279).~~

For BPSK modulation with DCM, the input ~~stream is~~ bits of the constellation mapper are broken into groups of  *NCBPS* *u* bits *B*0 *B*1  *BN\_CBPS,u*). *NCBPS,u* values for use with DCM are given for each RU in the Table 36-70 to Table 36-85 for MCS 15 and in Table 36-86 for MCS 14. Each bit *Bk* is BPSK modulated to a sample *d*'*k* . This generates the samples for the lower half of the data subcarriers (*k*=0, 1, …, *NSD* – 1). For the upper half of the data subcarriers, the samples are generated as *d*'*k* + *N\_SD*= *d*'*k ej(k+N\_SD)p*, *k*=0, 1, …, *NSD* – 1.

When DCM is employed for an MRU smaller than a 996-tone RU, bit sequences are mapped according to the following steps:

* For each of the RUs making up the MRU, determine the corresponding value of *NSD* and *NCBPS,u*
* Generate samples *d*'*k* for that RU following the steps given above for a 996-tone or smaller RU using these values
* Assign the samples *d*'*k* (*k*=0, 1, …, 2*NSD* – 1) to the subcarriers corresponding to the location of the RU within the MRU

For instance, for an MRU of size 242+484 with the second 20 MHz punctured:

* Map 117 bits to BPSK values and duplicate these values to fill the 234 data tones corresponding to the lowest 20 MHz in the 80 MHz subblock
* Map an additional 234 bits to BPSK values and duplicate these values to fill the 468 data tones corresponding to the upper 40 MHz in the 80 MHz subblock

For RU sizes larger than 996 tones, DCM is performed within each 80 MHz subblock(#1279). For each subblock, DCM mapping is performed as if that subblock consists of an RU or MRU of size smaller than or equal to 996 tones, as described above.

For instance, for an MRU of size 242+484+996 with the second 20 MHz punctured:

* The first 80 MHz subblock performs DCM mapping as an MRU of size 242+484 with the second 20 MHz punctured (for a total of 351 data bits)
* The second 80 MHz subblock performs DCM mapping as an RU of size 996 tones (for a total of 490 data bits)