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| EDMG-Header-A Encoding and Modulation for EDMG SC/OFDM mdoe A-PPDU |
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Abstract

This document proposes changes on specification text of 30.5.7 describing EDMG-Header-A encoding and modulation for EDMG SC mode A-PPDU [1] to reflect the modification in EDMG-Header-B encoding proposed in [2].

Also this document provides new specification text describing EDMG-Header-A encoding and modulation for EDMG OFDM mode A-PPDU.

30.5 EDMG SC mode

*Replace 30.5.7 with following text:*

30.5.7 Encoding of EDMG-Header-A for EDMG A-PPDU transmission

The EDMG-Header-A field in the first EDMG PPDU in an EDMG SC mode A-PPDU (i.e., *iPPDU* = 1, where *iPPDU* represents the PPDU index number aggregated into the EDMG A-PPDU) is encoded and modulated as specified in 30.3.3.3.2.4.

For the *iPPDU*th EDMG PPDU in the EDMG SC mode A-PPDU, where *iPPDU* > 1, the EDMG-Header-A field shall be encoded and modulated as follows:

* The input 112 header bits are appended with 16 HCS bits calculated as defined in 20.3.7.
* The header 128 bits (including CRC) **b** = (*b1*, *b2*,…, *b128*) are scrambled with PN sequence as described in 20.3.9, starting from the first bit using a continuation of the scrambler bit sequence from data field of preceding EDMG PPDU in the EDMG SC mode A-PPDU to create **bq** = (*bq1*, *bq2*,…, *bq128*) sequence.
* The scrambled header bits **bq** are divided into two parts **bq1** = (*bq1*, *bq2*,…, *bq64*) and **bq2** = (*bq65*, *bq66*,…, *bq128*) of 64 bits each.
* Two LDPC codewords of length 672 bits each are created by concatenating the 440 zeros to the each part **bq1** and **bq2** and then computing 168 parity bits **p1** = (*p11*, *p12*,…, *p1168*) and **p2** = (*p21*, *p22*,…, *p2168*) for **bq1** and **bq2** respectively using LDPC matrix with *R* = 3/4 and *LCW* = 672 defined in 20.3.8.4. The LDPC codewords are defined as follows:
* **cw1** = (*bq1*, *bq2*,…, *bq64*, 01, 02,…, 0440, *p11*, *p12*,…, *p1168*)
* **cw2** = (*bq65*, *bq66*,…, *bq128*, 01, 02,…, 0440, *p21*, *p22*,…, *p2168*)
* The padded zeros are discarded and two output codewords are defined as **c1** = (**c11**, **c12**) and **c2** = (**c21**, **c22**), where:
* **c11** = (*bq1*, *bq2*,…, *bq64*, *p11*, *p12*,…, *p1160*)
* **c12** = (*bq1*, *bq2*,…, *bq64*, *p11*, *p12*,…, *p1152*, *p1161*, *p1162*,…, *p1168*)
* **c21** = (*bq65*, *bq66*,…, *bq128*, *p21*, *p22*,…, *p2160*)
* **c22** = (*bq65*, *bq66*,…, *bq128*, *p21*, *p22*,…, *p2152*, *p2161*, *p2162*,…, *p2168*)
* For a PPDU transmitted over an *NCB* × 2.16 GHz channel, where 1 ≤ *NCB* ≤ 4, the data blocks are defined as a repetition of codeword **c1** and **c2** by *NCB* times:
* **cb1** = **c1**, **cb2** = **c2** for *NCB* = 1
* **cb1** = (**c1**, **c1**), **cb2** = (**c2**, **c2**) for *NCB* = 2
* **cb1** = (**c1**, **c1**, **c1**), **cb2** = (**c2**, **c2**, **c2**) for *NCB* = 3
* **cb1** = (**c1**, **c1**, **c1**, **c1**), **cb2** = (**c2**, **c2**, **c2**, **c2**) for *NCB* = 4
* For a PPDU transmitted using *NSTS* (*NSTS* = 1,2,…,8) space-time streams, the data blocks **cb1** and **cb2** are concatenated as **cb** = (**cb1**, **cb2**) and the data block **cb** is repeated *NSTS* times. Then the *NSTS* data blocks **cb** are scrambled continuously with PN sequence as defined in 30.5.8.3.2 without seed reset. The initial seed value is equal to all ones (11, 12,…, 17). The scrambling starts at the 225th bit and ends at the (*NSTS* ×896 × *NCB*)th bit. The first scrambled **cb** block is mapped to the first space-time stream and the second scrambled **cb** block to the second space-time stream, and so on.

The data blocks shall be modulated using π/2-BPSK modulation as defined in 20.6.3.2.4. Each of the modulated data blocks **cb1** and **cb2** is prepended with 64 × *NCB* guard symbols, and the data block **cb2** is appended with approproate number of guard symbols as described in 30.5.8.2.3.

30.6 EDMG OFDM mode

*Insert the following new subclause 30.6.6 and shift the rest of sections by one:*

30.6.6 Encoding of EDMG-Header-A for EDMG A-PPDU transmission

The EDMG-Header-A field in the first EDMG PPDU in an EDMG OFDM mode A-PPDU (i.e., *iPPDU* = 1, where *iPPDU* represents the PPDU index number aggregated into the EDMG A-PPDU) is encoded and modulated as specified in 30.3.3.3.2.4.

For the *iPPDU*th EDMG PPDU in the EDMG OFDM mode A-PPDU, where *iPPDU* > 1, the EDMG-Header-A field shall be encoded and modulated using two OFDM symbols. The encoding and modulation shall be as follows:

* The input 112 header bits are appended with 16 HCS bits calculated as defined in 20.3.7.
* The header 128 bits (including CRC) **b** = (*b1*, *b2*,…, *b128*) are scrambled with PN sequence as described in 20.3.9, starting from the first bit using a continuation of the scrambler bit sequence from data field of preceding EDMG PPDU in the EDMG OFDM mode A-PPDU to create **bq** = (*bq1*, *bq2*,…, *bq128*) sequence.
* The scrambled header bits **bq** are divided into two parts **bq1** = (*bq1*, *bq2*,…, *bq64*) and **bq2** = (*bq65*, *bq66*,…, *bq128*) of 64 bits each.
* Two LDPC codewords of length 672 bits each are created by concatenating the 440 zeros to the each part **bq1** and **bq2** and then computing 168 parity bits **p1** = (*p11*, *p12*,…, *p1168*) and **p2** = (*p21*, *p22*,…, *p2168*) for **bq1** and **bq2** respectively using LDPC matrix with *R* = 3/4 and *LCW* = 672 defined in 20.3.8.4. The LDPC codewords are defined as follows:
* **cw1** = (*bq1*, *bq2*,…, *bq64*, 01, 02,…, 0440, *p11*, *p12*,…, *p1168*)
* **cw2** = (*bq65*, *bq66*,…, *bq128*, 01, 02,…, 0440, *p21*, *p22*,…, *p2168*)
* The padded zeros are discarded and two output codewords are defined as **c1** = (**c11**, **c12**, **c13**) and **c2** = (**c21**, **c22**, **c23**), where:
* **c11** = (*bq1*, *bq2*,…, *bq64*, *p19*, *p110*,…, *p1168*)
* **c12** = (*bq1*, *bq2*,…, *bq64*, *p11*, *p12*,…, *p184*, *p193*, *p194*,…, *p1168*)
* **c13** = (*bq1*, *bq2*,…, *bq64*, *p11*, *p12*,…, *p1160*)
* **c21** = (*bq65*, *bq66*,…, *bq128*, *p29*, *p210*,…, *p2168*)
* **c22** = (*bq65*, *bq66*,…, *bq128*, *p21*, *p22*,…, *p284*, *p293*, *p294*,…, *p2168*)
* **c23** = (*bq65*, *bq66*,…, *bq128*, *p21*, *p22*,…, *p2160*)
* For a PPDU transmitted over an *NCB* × 2.16 GHz channel, where 1 ≤ *NCB* ≤ 4, the data blocks are defined as a repetition of codeword **c1** and **c2** as follows:
* **cb1** = **c1**, **cb2** = **c2** for *NCB* = 1
* **cb1** = (**c1**, **c1**, **c11:124**), **cb2** = (**c2**, **c2**, **c2124**) for *NCB* = 2
* **cb1** = (**c1**, **c1**, **c1**, **c11:252**), **cb2** = (**c2**, **c2**, **c2**, **c21:252**) for *NCB* = 3
* **cb1** = (**c1**, **c1**, **c1**, **c1**, **c11:376**), **cb2** = (**c2**, **c2**, **c2**, **c2**, **c21:376**) for *NCB* = 4
* For a PPDU transmitted using *NSTS* (*NSTS* = 1,2,…,8) space-time streams, the data blocks **cb1** and **cb2** are concatenated as **cb** = (**cb1**, **cb2**) and the data block **cb** is repeated *NSTS* times. Then the *NSTS* data blocks **cb** are scrambled with PN sequence as defined in 30.5.8.3.2 without seed reset. The initial seed value is equal to all ones (11, 12,…, 17). The scrambling starts at the 225th bit and ends at the (*NSTS* × 4 × *NSD*)th bit. The first scrambled **cb** block is mapped to the first space-time stream and the second scrambled **cb** block to the second space-time stream, and so on.

The **c11:m** and **c21:m** notations define an array of vector **c1** and **c2** elements, starting from the first bit (inculsive) and ending at the *m*th bit (inculsive).

The data blocks shall be modulated using QPSK modulation with Static Tone Paring (STP). The EDMG-Header-A field shall use an OFDM modulation as defined for the data part of PPDU in 30.6.7.2.

**References:**

1. Draft P802.11ay\_D0.8
2. 11-17/1581r0

**Straw Poll**

* Do you agree to include the EDMG-Header-A encoding and modulation for EDMG SC/OFDM mode A-PPDU proposed in 11-17/1678r0 to the Draft amendment?