IEEE P802.11
Wireless LANs

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| Space-Time Block Coding bug fix in OFDM PHY |
| Date: 2019-09-14 |
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Abstract

This document proposes a bug fix for space-time block coding (STBC) in OFDM PHY. Changes are proposed in reference to TGay D4.0 [1].

**Intended STBC operation (see 11-18/0186r2)**

* Each spatial stream is independently STBC encoded
	+ Multiplication of a single stream STBC encoder
	+ Even number of space-time streams , i.e. NSTS=2NSS

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* The bug is in the equation defining the transition from NSS spatial streams to 2NSS space-time streams
	+ The first index of $d(i\_{SS},2n,k)$ or $d(i\_{SS},2n+1,k)$ gets out of range ($1\leq i\_{SS}\leq N\_{SS}$)
	+ In addition the mapping makes no sense
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*TGay Editor: Please modify subclause “29.6.9.3.10 Space-time block coding (P579, L16) [1]” by changing the four indicated equations as follows*

* + - * 1. Space-time block coding

An EDMG STA shall only apply STBC to an EDMG PPDU transmitted to a peer EDMG STA if the STBC Type field in the peer STA’s EDMG Capabilities element is nonzero.

The space-time block coding (STBC) for the EDMG OFDM mode maps NSS spatial streams to 2×*NSS* space-time streams. STBC is applied to an EDMG PPDU if, in the EDMG-Header-A of the PPDU, the STBC field is equal to 1. The number of STBC modulated spatial streams *NSS* is given by Number of SS field in the EDMG-Header-A. *NSS* shall not exceed four for an SU PPDU and one per user for an MU PPDU.

The mapping of each spatial stream, *iSS* = 1, …, *NSS*, includes the following steps for the data subcarriers mapping:

1. The input bits of spatial stream iSS are broken into the groups of *NCBPS(iSS)* bits, , where *q* denotes the group number. The STBC applies the encoding procedure defined in 29.6.8. The padding procedure requires that the total number of groups of *NCBPS(iSS)* bits shall be an even number.
2. Each group of bits , *k* = 0, 1, …, *NSD* - 1 is converted to the constellation point , *q* = 0, 1, …, *NSYM* - 1, following the rules defined in in 29.6.9.3.3, 29.6.9.3.5, 29.6.9.3.6, and 29.6.9.3.7.
3. The modulated data sequence *D*(*iSTS* = 2×iSS-1, *n*, *k*) for the odd space-time stream is defined by inserting 0s from –*NSR* to *NSR* and then inserting data at tones *Md*(*k*) defined in 29.6.2.5 as follows:

,

, *k* = 0, 1, …, *NSD* - 1

1. The modulated data sequence *D*(*iSTS* = 2×iSS, *n*, *k*) for the even space-time stream is defined by inserting 0s from –*NSR* to *NSR* and then inserting data at tones *Md*(*k*) defined in 29.6.2.5 as follows:

,

, *k* = 0, 1, …, *NSD* - 1

1. The modulated pilot sequence *P*(*iSTS* = 2×iSS-1, *n*, *k*) for the odd space-time stream is defined by inserting 0s from –*NSR* to *NSR* and then inserting pilots at tones *Mp*(*k*) defined in 29.6.2.4 as follows:

,

,
*k* = 0, 1, …, *NSP* - 1

1. The modulated pilot sequence *P*(*iSTS* = 2×iSS, *n*, *k*) for the even space-time stream is defined by inserting 0s from –*NSR* to *NSR* and then inserting pilots at tones *Mp*(*k*) defined in 29.6.2.4 as follows:

,

,
*k* = 0, 1, …, *NSP* - 1

In the above procedure, index *n* = 0, 1, …, *NSYM* / 2– 1, pilot sequences *PNSP*(*iSTS* = 2×iSS-1, *k*) and *PNSP*(*iSTS* = 2xiSS, *k*) are defined in 29.6.2.6 and *p*(*n*) defines a bit coming from the scrambler defined in 29.6.9.1 with shift register x1, x2,…, x7 initialized to all 1s for the *n* = 0 OFDM symbol.

**References**

[1] 802.11ay Draft 4.0

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Do you agree to accept the bug fix resolution for STBC in OFDM PHY as proposed in 11-19/1602r0?