Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
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Re:	
Abstract	Modification of the open loop STC for 3, 4 Tx
Purpose	Adoption of proposed changes into P802.16e ~~Crossed-out indicates deleted text,~~ underlined blue indicates new text change to the Standard
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Modification of Open loop STC

1. Introduction

In 802.16e D7, the accepted contribution 175r1 is only partially reflected. The editor asked for clarification in terms of how to incorporate the part that comes from accepted 009r1. We provide detailed instructions on how to incorporate these text changes in this revision.

2. Proposed Clarification to the Space-Time Codes

Since, there are space-time-frequency codes (over two OFDMA symbols and two sub-carriers) in [1], we propose a modification of the 3 Tx antenna STC for rate 1 and 2, i.e., Matrix A, Matrix B, should be changed to:

$$k = \mathrm{mod}(\mathrm{floor}((\mathrm{logical\_data\_sub\text{-}carrier\_number\_for\_first\_tone\_of\_code} - 1)/2), 3) + 1$$

In addition, the above equation can be applied to the 4Tx antenna rate 1 (Matrix A).

where, logical_data_sub-carrier_number_for_first_tone_of_code = 1, 2, 3, …, total number of data subcarriers.

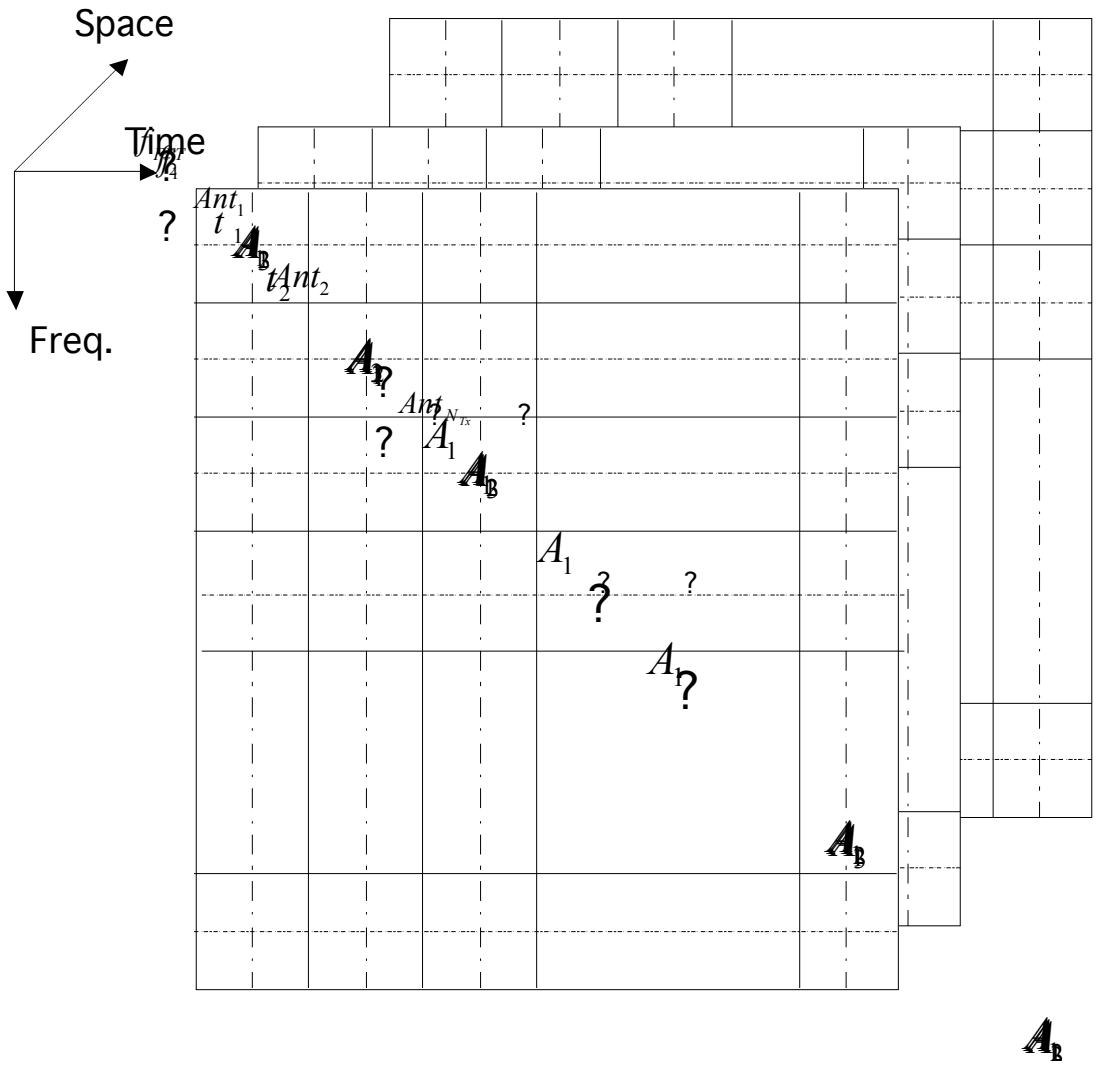

Fig 1. An example of the choice of subscript *k* to determine the Matrix A.

For 4Tx rate 2 case, since there are 6 different B Matrices, therefore, expression for *k* is changed to

$$k = \mathrm{mod}\left(\mathrm{floor}\left(\left(\mathrm{logical\_data\_sub}-\mathrm{carrier\_number\_for\_first\_tone\_of\_code}-1\right)/2\right),6\right)+1.$$

3. Specific Text Changes

[Modify the section 8.4.8.3.4(line 17, page 416 of [1]) as follows]

8.4.8.3.4 Transmission schemes for 3 antenna BS
(Note to editor 4/27/05: This part has been reflected in the D7.)

~~In optional FUSC zones, t~~The index k, of permuted version of Matrix A and B to use for a particular deployment is given by : ~~*k=mod(logical_data_sub-carrier_number_for_first_tone_of_code,3)+1*~~ *k* = mod(floor(*(logical_data_sub-carrier_number_for_first_tone_of_code-1)/2) , 3) + 1*, where *logical_data_sub-carrier_number_for_first_tone_of_code*=1,2,3,…, Total # of data sub-carriers.

End text proposal

[Modify the section 8.4.8.3.5(line 58, page 418 of [1]) as follows]

8.4.8.3.5 Transmission schemes for 4-antenna BS

(Note to editor 4/27/05: The next two lines has been reflected in the D7.)
The choice of subscript k to determine the matrix A_k is given by the following formula:

~~*k = mod(logical_data_sub-carrier_number_for_first_tone_of_code , 3) + 1,*~~ *k* = mod(floor(*(logical_data_sub-carrier_number_for_first_tone_of_code-1)/2) , 3) + 1*

where *logical_data_sub- carrier_number_for_first_tone_of_code*=1,2,3,…, total # of data sub-carriers.

Note: The following subsection is a part of contribution 05/009r1 (comment # 1534), which was accepted in Sanya meeting, Jan 2005. However, it did not appear in the latest D6 version of 802.16e spec. 3/17/05

(Note to editor 4/27/05: This part lines has NOT been reflected in the D7. We have added more editorial instructions to clarify the incorporation of this accepted text.

Insertion point in D7: Page 446, before line 1, section 8.4.8.3.5

The proposed Space-Time-Frequency code (over two OFDMA symbols and two sub-carriers) for 4Tx-Rate 2 configuration is given in six permuted versions:

$$B_1 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_4 & S_3^* & S_8 & S_7^* \end{bmatrix}, \quad B_2 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_3 & -S_4^* & S_7 & -S_8^* \end{bmatrix}, \quad B_3 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_4 & S_3^* & S_8 & S_7^* \end{bmatrix},$$

$$B_4 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_2 & S_1^* & S_6 & S_5^* \end{bmatrix}, \quad B_5 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_3 & -S_4^* & S_7 & -S_8^* \end{bmatrix}, \quad B_6 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_2 & S_1^* & S_6 & S_5^* \end{bmatrix},$$

The choice of subscript k to determine the matrix is given by the following formula: k =mod(floor(logical_data_sub_carrier_number_for_first_tone_of_code-1/2),6)+1. where logical_data_sub_carrier_number_for_first_tone_of_code = 1,2,3,…,Total # of data sub-carriers.

For 4Tx, rate 4 the following transmission matrix shall be used

where S_i may have different rates.

~~For all optional permutation zones using 4 antenna BS, one of the following three transmission matrices shall be used:~~

~~$$\mathbf{A} = \begin{bmatrix} S_1 & -S_2^* & 0 & 0 \\ S_2 & S_1^* & 0 & 0 \\ 0 & 0 & S_3 & -S_4^* \\ 0 & 0 & S_4 & S_3^* \end{bmatrix}$$~~

~~where Si may have different rates.~~

Note: End of excerpt from accepted 05/009. Comment # 1534

End text proposal

References:

[1] IEEE P802.16-REVd/D6-2005 Draft IEEE Standards for local and metropolitan area networks part 16: Air interface for fixed broadband wireless access systems