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| Re: | |
| Abstract | Modification of the open loop STC for 3, 4 Tx |
| Purpose | Adoption of proposed changes into P802.16e<br><br>~~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

We propose a modification to the space-time codes for 3 and 4 transmit antennas in the OFDMA PHY.

## 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:

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

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.

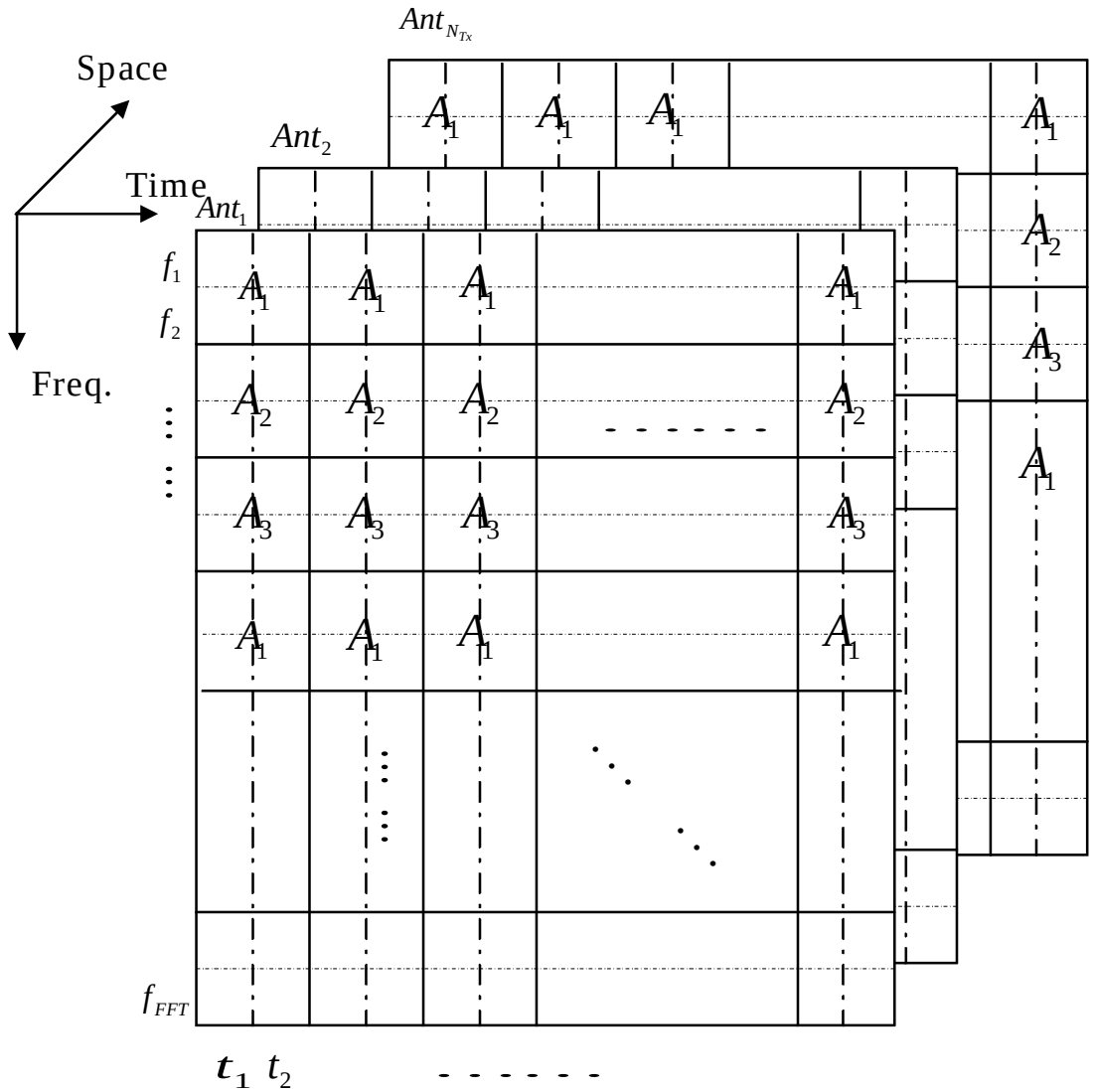


Fig 1. An example of the choice of subscript *k* to determine the Matrix A.

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

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

# 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**

~~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.

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*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**

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.

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:

$$\mathrm{B}_1 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_4 & S_3^* & S_8 & S_7^* \end{bmatrix}, \quad \mathrm{B}_2 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_3 & -S_4^* & S_7 & -S_8^* \end{bmatrix}, \quad \mathrm{B}_3 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_4 & S_3^* & S_8 & S_7^* \end{bmatrix},$$

$$\mathrm{B}_4 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_2 & S_1^* & S_6 & S_5^* \end{bmatrix}, \quad \mathrm{B}_5 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_2 & S_1^* & S_6 & S_5^* \\ S_3 & -S_4^* & S_7 & -S_8^* \end{bmatrix}, \quad \mathrm{B}_6 = \begin{bmatrix} S_1 & -S_2^* & S_5 & -S_6^* \\ S_4 & S_3^* & S_8 & S_7^* \\ S_3 & -S_4^* & S_7 & -S_8^* \\ S_2 & S_1^* & S_6 & S_5^* \end{bmatrix}$$

The choice_of_subscript k to determine the matrix $\overline{B_k}$ 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.

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

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*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