

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	Modification of Open loop STC	
Date Submitted	2004-3-09	
Source(s)	Chan-Byoung Chae, Wonil Roh, Sung-Ryul Yun, Kyunbyoung Ko, Hongsil Jeong, JeongTae Oh, Seungjoo Maeng, Panyuh Joo, Jaeho Jeon, Jerry Kim, Soonyoung Yoon, K. Sivanesan, Marcos Katz, DS Park	cb.chae@samsung.com
	Samsung Electronics Co., Ltd.	
	Jianzhong (Charlie) Zhang, Anthony Reid, Kiran Kuchi, Heikki Berg, Nico Van Waes	Charlie.Zhang@nokia.com
	Nokia Research Center	
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 , <u>underlined blue indicates new text change to the Standard</u>	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures (Version 1.0) < http://ieee802.org/16/ipr/patents/policy.html >, including the statement "IEEE standards may include the known use of patent(s), including patent applications, if there is technical justification in the opinion of the standards-developing committee and provided the IEEE receives assurance from the patent holder that it will license applicants under reasonable terms and conditions for the purpose of implementing the standard."	
	Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair < mailto:r.b.marks@ieee.org > as early as possible, in written or electronic form, of any patents (granted or under application) that may cover technology that is under consideration by or has been approved by IEEE 802.16. The Chair will disclose this notification via the IEEE 802.16 web site < http://ieee802.org/16/ipr/patents/notices >.	

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:

$$k = \text{mod}(\text{floor}(((\text{logical_data_sub_carrier_number_for_first_tone_of_code} - 1) / 2), 3) + 1$$

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.

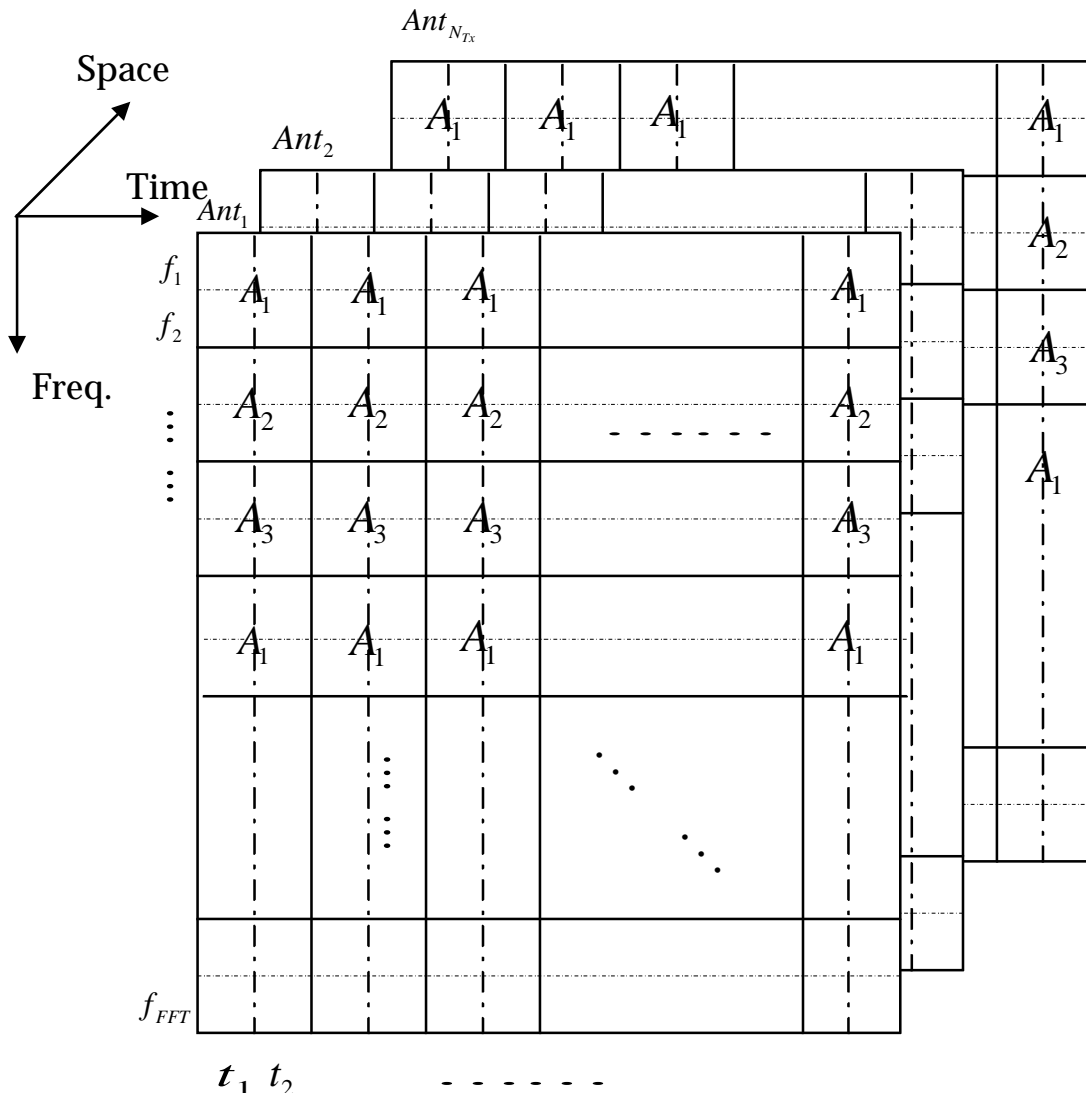


Fig 1. An example of the choice of subscript k to determine the Matrix A.

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

$$k = \text{mod}(\text{floor}(\text{logical_data_sub_carrier_number_for_first_tone_of_code} - 1)/2), 6) + 1.$$

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, †The index k , of permuted version of Matrix A and B to use for a particular deployment is given by : $k = \text{mod}(\text{logical_data_sub_carrier_number_for_first_tone_of_code}, 3) + 1$~~ $k = \text{mod}(\text{floor}(\text{logical_data_sub_carrier_number_for_first_tone_of_code} - 1)/2), 3) + 1$, where $\text{logical_data_sub_carrier_number_for_first_tone_of_code} = 1, 2, 3, \dots$, 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

The choice of subscript k to determine the matrix A_k is given by the following formula:

$$\del{k = \text{mod}(\text{logical_data_sub_carrier_number_for_first_tone_of_code}, 3) + 1}$$

$$k = \text{mod}(\text{floor}(\text{logical_data_sub_carrier_number_for_first_tone_of_code} - 1)/2), 3) + 1$$

where $\text{logical_data_sub_carrier_number_for_first_tone_of_code} = 1, 2, 3, \dots$, total # of data sub-carriers.

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