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Re:	This is a response to a Call for Comments on IEEE P802.16e-D5
Abstract	STC sub-packet combining scheme can be applied to 3 transmit antenna in OFDMA
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STC sub-packet combining for 3 transmit antennas in OFDMA

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1. Introduction

In OFDMA of the current 802.16e standard, In order to enhance H-ARQ performance use spatial diversity through proper arrangement of the re-transmission packet. So STC sub-packet retransmission schemes for 2 and 4-antenna are supported in section '8.4.8.9 STC sub-packet combining'. We propose to add a STC sub-packet retransmission scheme for 3-antenna.

2. Soft packet combing for 3-antennas

If the packet was failed to decode at receiver, then a re-transmission is requested. In the MIMO mode transmission, MIMO packet combing can use spatial diversity of the MIMO channel, the MIMO packet combining can reduce the re-transmission number and reduce the packet re-transmission.

Retransmission scheme is as follows:

	initial transmission	odd re-transmission	even re-transmission
Space time code incremental redundancy for matrix C	$s^{(0)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \end{bmatrix}$	$s^{(odd)} = \begin{bmatrix} -s_2^* \\ s_1^* \\ s_3^* \end{bmatrix}$	$s^{(even)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \end{bmatrix}$

The first transmit MIMO packet is $\begin{bmatrix} s_1 \\ s_2 \\ s_3 \end{bmatrix}$ in 3-antennas BS, if the packet is error, the re-transmission of the same packet is

send in the form of $\begin{bmatrix} -s_2^* \\ s_1^* \\ s_3^* \end{bmatrix}$ then, such a re-transmission have the SNR gain since the first and second transmission have the

space time block coding form.

3. Simulation results

In the simulation, we used band AMC mode, convolutional code 1/2 and QPSK and zero-forcing decoder was used. Retransmission delay is 5ms (1 frame delay).
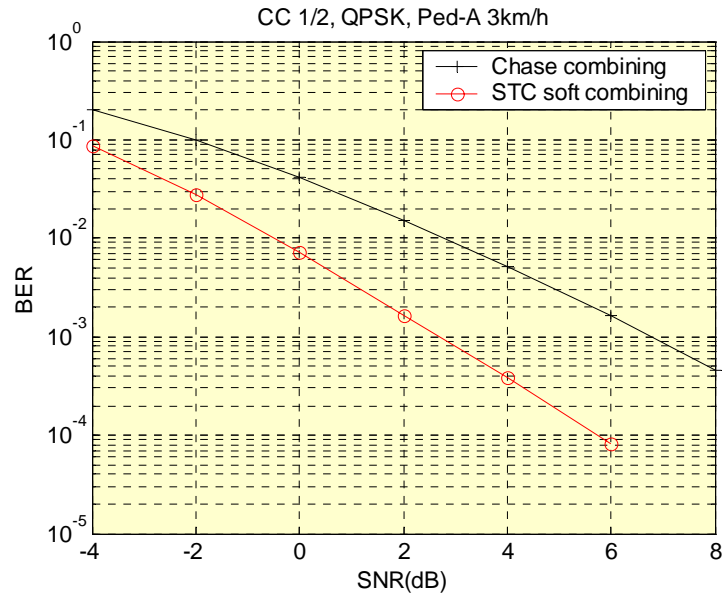

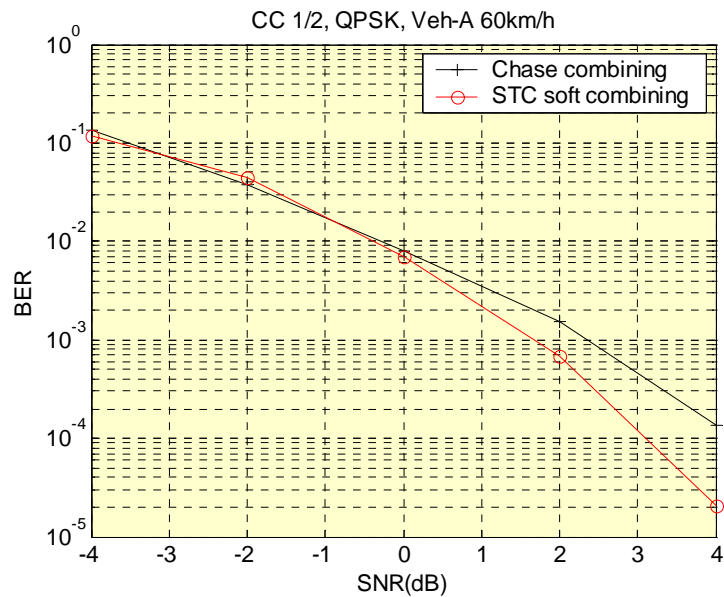Figure 1. Performance for soft MIMO packet combining at 3km

Figure 2.   Performance for soft MIMO packet combining at 60Km

4. Proposed Text Change

[Modify the section '8.4.8.9 STC sub-packet combining' in p.259]

8.4.8.9 STC sub-packet combining

In the STC transmission, for both downlink and uplink, the STC sub-packet re-transmission can be generated by using the Space-time code incremental redundancy version. The transmission rule for space-time coded incremental redundancy codes set is listed in Table 314l, Table 314m and Table 314mn.

Table 314l STC subpacket combining (2-transmit antenna case)

	initial transmission	odd re-transmission	even re-transmission
Space time code incremental redundancy for matrix B	$s_2^{(0)} = \begin{bmatrix} s_1 \\ s_2 \end{bmatrix}$	$s_2^{(odd)} = \begin{bmatrix} -s_2^* \\ s_1^* \end{bmatrix}$	$s_2^{(even)} = \begin{bmatrix} s_1 \\ s_2 \end{bmatrix}$

Table 314m STC subpacket combining (3-transmit antenna case)

	initial transmission	odd re-transmission	even re-transmission
Space time code incremental redundancy for matrix C	$s_2^{(0)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \end{bmatrix}$	$s_2^{(odd)} = \begin{bmatrix} -s_2^* \\ s_1^* \\ s_3^* \end{bmatrix}$	$s_2^{(even)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \end{bmatrix}$

Table 314mn STC subpacket combining (4-transmit antenna case)

	initial transmission	odd re-transmission	even re-transmission
Space time code incremental redundancy for matrix C	$s_2^{(0)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \\ s_4 \end{bmatrix}$	$s_2^{(odd)} = \begin{bmatrix} -s_2^* \\ s_1^* \\ -s_4^* \\ s_3^* \end{bmatrix}$	$s_2^{(even)} = \begin{bmatrix} s_1 \\ s_2 \\ s_3 \\ s_4 \end{bmatrix}$

The MSS shall process the initial transmission, 1st re-transmission and 2nd re-transmission etc in the form of space time decoding. The re-transmission of FEC code word shall use the Chase combing re-transmission.