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Re:	This is a response to a Call for Comments on IEEE P802.16e-D4
Abstract	We propose a flexible MIMO feedback scheme to support closed-loop methods such as TxAA
Purpose	This document is submitted for review by 802.16e Working Group members
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Closed- loop MIMO enhancement

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1. Introduction

In the current specification 802.16e/D4, closed-loop MIMO scheme is supported as in 8.4.8.3.4 and 8.4.8.3.6. In this contribution, we propose a flexible MIMO feedback scheme to support several closed-loop methods.

If there is a method to estimate the channel from TX antenna to RX antenna, SS can compute the weight matrix W for best DL reception and send back W through the allocated CQICH. The size of W can be informed by BS or decided by SS. When SS decides the size of W, SS knows the number of rows of W through the 'NT actual BS antenna' field and decides the number of column of W as a result of its own closed-loop MIMO algorithm such as water-filling, TxAA and etc. Decided number of column of W should be sent back to BS through the 5-bit or 6-bit payload. In addition, indicating the available tx power of BS on the burst of SS is helpful for SS to calculate the optimal W.

2. Specific Text Change

[Apply the following changes to Table 298a in Section 8.4.5.4.12.1, page 134:]

Table 298 a. CQICH Enhanced allocation IE format

Syntax	Size(bits)	Notes
CQICH_Enhanced_Alloc_IE() {		
Extended DIUC	4	
Length	4	Length (in bytes) of the following fields
CQICH ID	Variable	Index to uniquely identify the CQICH resource assigned to the SS
Period (=p)	2	A CQI feedback is transmitted on the CQICH every 2p frames
Frame offset	3	The SS starts reporting at the frame of which the number has the same 3 lsb as the specified frame offset. If the current frame is specified, the SS should start reporting in 8 frames.
Duration (=d)	3	A CQI feedback is transmitted on the CQI channels indexed by the CQICH_ID for 10 x 2d frames. If d == 0, the CQI-CH is de-allocated. If d == 111, the SS should report until the BS Commend for the SS to stop.
NT actual BS antennas	3	001 = Reserved 010 = 2 actual antennas 011 = 3 actual antennas 100 = 4 actual antennas 101 = 5 actual antennas 110 = 6 actual antennas 111 = 7 actual antennas 000 = 8 actual antennas
Feedback type	4	0000 = Open loop precoding. Pilots in burst to be precoded with W. SS to rely only on pilots in burst for channel estimation 0001 = Complex weight of specific element of W 0010 = Fast DL measurement 0011 = Layer specific channel strengths 0100 = MIMO mode and permutation zone feedback 0101 = Feedback of subset of antennas to use 0110 ~ 1111 reserved

Max. TX power	4	Available TX power of BS per SS
CQICH_Num	4	Number of CQICHs assigned to this CQICH_ID is (CQICH_Num + 1)
For (i=0; i<CQICH_Num; i++) {		
Allocation index	6	Index to the fast feedback channel region marked by UIUC =0
Element index	5	If(Feedback type = 0001) index of element of weight matrix elseif(Feedback type = 0010), index of element of channel quality matrix
}		
if (Feedback_type != 11) {		
MIMO permutation feedback cycle	2	00 = No MIMO and permutation mode feedback 01 = the MIMO and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every 4 frames. The first indication is sent on the 8th CQICH frame. 10 = the MIMO mode and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every 8 frames. The first indication is sent on the 8th CQICH frame. 11 = the MIMO mode and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every 16 frames. The first indication is sent on the 16th CQICHframe.
}		
Padding	variable	
}		

Element index

This parameter indicates the index of specific element of weight or channel quality matrix reported by MSS.

[apply the changes into 8.4.5.3.17.3, page 128]

8.4.5.3.17.3 Mode Selection Feedback

When the FAST_FEEDBACK subheader Feedback Type field is '11' or at a specific frame indicated in the CQICH_Alloc_IE(), or when the Type field is '010' in CQICH_Enhanced_Alloc_IE(), the SS shall send its selection in terms of MIMO mode (STTD versus SM), ~~or~~ permutation mode or number of STC outputs indicating the number of columns of weight matrix on the assigned FAST_FEEDBACK channel. Table ~~dd~~ 284i shows the encoding of payload bits for the FAST_FEEDBACK slot (see 8.4.5.4.9).

Table 284i —Encoding of payload bits for Fast-feedback slot with 5 bit payload

Value	Description
0b00000	STTD and PUSC/FUSC permutation
0b00001	STTD and adjacent-subcarrier permutation
0b00010	SM and PUSC/FUSC permutation
0b00011	SM and adjacent-subcarrier permutation
0b00100	Hybrid and PUSC/FUSC permutation
0b00101	Hybrid and adjacent-subcarrier permutation
0b00110	Beamforming and adjacent-subcarrier permutation
0b10xxx	Closed-loop SM and PUSC/FUSC permutation
0b11xxx	Closed-loop SM and adjacent-subcarrier permuation
0b1x000	1 STC outputs
0b1x001	2 STC outputs

0b1x010	3 STC outputs
0b1x011	4 STC outputs