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Re:	This is a response to a Call for Comments on IEEE P802.16e-D4	
Abstract	We propose DL fast feedback channel for transmission of MIMO related information to support the closed-loop MIMO in the uplink	
Purpose	This document is submitted for review by 802.16e Working Group members	
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Downlink Fast Feedback Channel

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1. Background

In IEEE 802.16e/D4, Closed-loop MIMO was introduced and BS receives feedback of weight from MSS through CQICH Enhanced allocation IE. However the specification does not consider the weight or CQI feedback from BS to MSS. We propose DL fast feedback channel for transmission of MIMO related information to support the closed-loop MIMO in the uplink.

2. Suggested change

[Change Table 274a on page 113-114 as follows:]

8.4.5.3.1 DIUC allocation

Table 274a – OFDMA DIUC values

DIUC	Usage
14	~~Reserved~~ DL fast feedback channel

DIUC=14 may be used for allocation of Subchannels for DL fast feedback channel.

[ADD the following text after 8.4.5.3.17]

8.4.5.3.18 DL FAST-FEEDBACK message mapping

Each DL FAST-FEEDBACK message occupies one slot according to permutation mode. DL FAST-FEEDBACK message are mapped in to the region marked by DIUC=14, in the DL-MAP, in a time-first order, as shown in Figure xxx

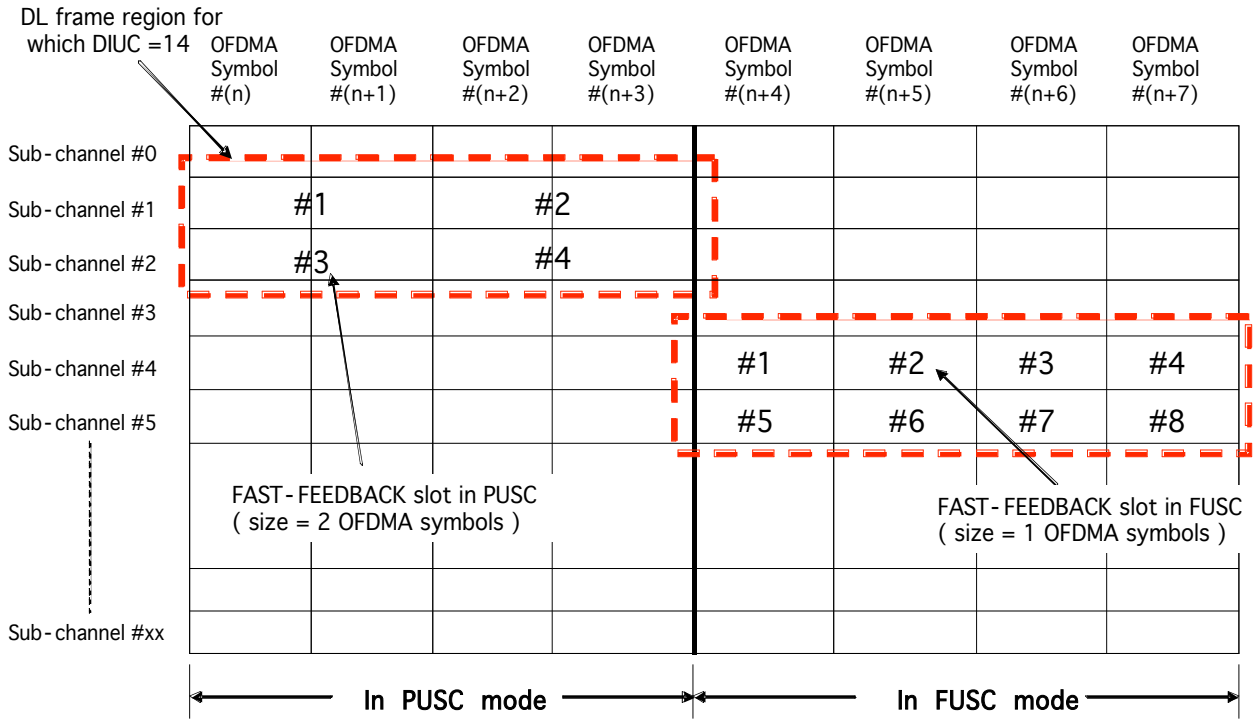

Figure xxx Mapping order of DL FAST-FEEDBACK message to the FAST-FEEDBACK region

8.4.5.4.19 DL FAST_FEEDBACK channels

BS individually allocates Fast Feedback slots to SS for transmission of MIMO related information that provides fast response to MSS. The location of Fast Feedback channel takes place in a specific DL region designated by DIUC = 14.

Each Fast-feedback slot consists of 1 OFDMA slots mapped in a manner similar to the mapping of normal downlink data. For PUSC mode, the slot consists of 2 symbols. And FUSC mode, the slot consists of 1 symbol.

A fast feedback slot uses QPSK modulation on the 48 data sub-carriers it contains, and can carry a data payload of 4bits. Table yyy defines the mapping between the payload bit sequences and the subcarriers modulation. where subcarriers(0) is the lower numbered data subcarrier in a slot

Table yyy. DL_FAST_FEEDBACK channel subcarrier modulation

4 bit payload	Fast Feedback vector indices subcarriers(0~7), subcarriers(8~15), subcarriers(16~23), subcarriers(24~31), subcarriers(32~39), subcarriers(40~47)
0b0000	0,0,0,0,0,0
0b0001	1,1,1,1,1,1
0b0010	2,2,2,2,2,2
0b0011	3,3,3,3,3,3
0b0100	4,4,4,4,4,4
0b0101	5,5,5,5,5,5
0b0110	6,6,6,6,6,6
0b0111	7,7,7,7,7,7
0b1000	0,1,2,3,4,5
0b1001	1,2,3,4,5,6

0b1010	2,3,4,5,6,7
0b1011	3,4,5,6,7,0
0b1100	4,5,6,7,0,1
0b1101	5,6,7,0,1,2
0b1110	6,7,0,1,2,3
0b1111	7,0,1,2,3,4

The DL fast-feedback code words used in Table zzz belong to a set of orthogonal vectors and are mapped directly to the subcarriers (see 8.4.9.4.2). The vectors are defined in Table zzz

Table zzz DL_FAST_FEEDBACK subcarrier modulation in each vector

Vector index	Data subcarrier modulation per Code word Subcarrier(8i), Subcarrier(8i+1), … , Subcarrier(8i+7) where i =0,1,2,3,4,5
0	P0, P1, P2, P3, P0, P1, P2, P3
1	P0, P3, P2, P1, P0, P3, P2, P1
2	P0, P0, P1, P1, P2, P2, P3, P3
3	P0, P0, P3, P3, P2, P2, P1, P1
4	P0, P0, P0, P0, P0, P0, P0, P0
5	P0, P2, P0, P2, P0, P2, P0, P2
6	P0, P2, P0, P2, P2, P0, P2, P0
7	P0, P2, P2, P0, P2, P0, P0, P2

where $P0 = \frac{1}{\sqrt{2}} \cdot \exp(j \cdot \frac{\pi}{4})$

$P0 = \frac{1}{\sqrt{2}} \cdot \exp(j \cdot \frac{3\pi}{4})$

$P0 = \frac{1}{\sqrt{2}} \cdot \exp(-j \cdot \frac{3\pi}{4})$

$P0 = \frac{1}{\sqrt{2}} \cdot \exp(-j \cdot \frac{\pi}{4})$

The fast feedback slot includes 4 bits of payload data, whose encoding depended on the instruction given in the FAST_FEEDBACK subheader.

8.4.5.4.20 CQICH_DL_location IE

In the DL-MAP, a BS may transmit DIUC =15 with the CQICH_DL_locaion_IE () to indicate that complex weight or channel quality information is transmitted to SS.

Table xxx – CQICH DL location IE ()

Synex	Size(bits)	Notes
CQICH_DL_location_IE() {		
Extended DIUC	4	CQICH_DL_location_IE = 0x0A
Length	4	Length (in bytes) of the following fields
Feedback_type	4	0000 = complex weight

		0001 = channel quality 0010-1111 = reserved
Matrix size	4	LSB 2bit is column, MSB 2bit is row
For (i=0 ; i<N_element ; i++){		N_element can be derived from the number of rows multiply by the number of columns
Allocation index	6	Index to the DL fast feedback channel region marked by DIUC =14 . MSS reads row-wise
Reserved	2	
}		
}		