Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Enhancements to fast feedback sub-channel**	
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Re:	Sponsor re-circulation Ballot	
Abstract	Enahanced modulation for fast feedback channel	
Purpose	Adoption of proposed enhancement into P802.16-REVd/D4-2004	
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1 Motivation and explanation of changes

The motivation for the proposed changes is to enable non-coherent detection of the modulation on the fast-feedback channel. Two major design objectives of this proposal are,
1. Seamless operation across PUSC, optional PUSC and AMC permutations
2. Use of regular QPSK constellation points

2 Proposed changes

Modify the text in page 486, line 40 to page 487, line 32 as shown below:

8.4.5.4.5 FAST_FEEDBACK channels

Fast feedback slots may be individually allocated to SS for transmission of PHY related information that requires fast response from the SS. The allocations are done in unicast manner through the FAST_FEEDBACK MAC subheader, and the transmission takes place in a specific UL region designated by UIUC=0.

Each Fast-feedback slot consists of ~~3~~1 OFDMA slot~~s~~ mapped ~~along the time axis~~ in a manner similar to the mapping of normal uplink data. A fast feedback slot uses QPSK modulation on the ~~96~~ 48 data sub-carriers it contains, and can carry a data payload of 4 bits. Table 263 and table aaa define~~s~~ the mapping between the payload bit sequences and the subcarriers modulation.

Table 263—FAST_FEEDBACK channel ~~subcarrier modulation~~ code words

4 bit payload	Fast Feedback vector indices per Tile ~~Code word for modulation~~ Tile(0), Tile(1), … Tile(5)
0000	~~0xbf0382090c3628b4f3ba299c~~ 0,0,0,0,0,0
0001	~~0xa814951e1b213fa3e4ad3e8b~~ 1,1,1,1,1,1
0010	~~0x922eaf24211b0599de9704b1~~ 2,2,2,2,2,2
0011	~~0x8539b833360c128ec98013a6~~ 3,3,3,3,3,3
0100	~~0xf14dcc47427866fabdf467d2~~ 4,4,4,4,4,4
0101	~~0xe65adb50556f71edaae370c5~~ 5,5,5,5,5,5
0110	~~0xdc60e16a6f554bd790d94aff~~ 6,6,6,6,6,6
0111	~~0xcb77f67d78425cc087ce5de8~~ 7,7,7,7,7,7
1000	~~0x3488098287bda33f7831a217~~ 0,1,2,3,4,5

1001	~~0x239f1e9590aab4286f26b500~~ 1,2,3,4,5,6
1010	~~0x19a524afaa908e12551c8f3a~~ 2,3,4,5,6,7
1011	~~0x0eb233b8bd879905420b982d~~ 3,4,5,6,7,0
1100	~~0x7ac647ccc9f3ed71367fec59~~ 4,5,6,7,0,1
1101	~~0x6dd150dbdee4fa662168fb4e~~ 5,6,7,0,1,2
1110	~~0x57eb6ae1e4dec05c1b52c174~~ 6,7,0,1,2,3
1111	~~0x40fc7df6f3c9d74b0c45d663~~ 7,0,1,2,3,4

The fast-feedback code words used in table 263 belong to a set of orthogonal vectors and are mapped directly to the subcarriers (see 8.4.9.4.2), where subcarriers(0) is the lowest numbered data subcarrier in the tile, and the tile indices are defined by the permutation (see 8.4.6.2). The vectors are defined in table aaa.

Table aaa—FAST_FEEDBACK subcarrier modulation in each vector

Vector index	Data subcarrier modulation per Code word Subcarrier(0), Subcarrier(1), … Subcarrier(7)
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,

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

$$P1 = \frac{1}{\sqrt{2}} \cdot \exp\left(j\frac{3\cdot\pi}{4}\right)$$

$$P2 = \frac{1}{\sqrt{2}} \cdot \exp\left(-j\frac{3\cdot\pi}{4}\right)$$

$$P3 = \frac{1}{\sqrt{2}} \cdot \exp\left(-j\frac{\pi}{4}\right)$$

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