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Source(s)	Myung-Kwang Byun, Seungjoo Maeng, Jaeho Jeon, Soonyoung Yoon, Panyuh Joo mk.byun@samsung.com Samsung Electronics Co., Ltd. Dong Suwon P.O.Box 105 416, Maetan-3dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea 442-600
Re:	
Abstract	Clarification on the UL ACK Channel
Purpose	Adopting of proposed method into P802.16e
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Clarification on the UL ACK Channel

Introduction

Current UL ACK channel is only supported by the optional UL PUSC. The suggested remedy can solve this problem such that the UL ACK channel can be supported by both UL PUSC and optional UL PUSC.

Suggested change to the standard

[Replace the section 8.4.5.4.13 with the following text]

8.4.5.4.13 UL ACK channel

The uplink ACK (Acknowledgement) provides feedback for Downlink Hybrid ARQ. This channel shall only be supported by SS supporting H-ARQ. The SS transmits ACK or NAK feedback for Downlink packet data. One ACK channel occupies half subchannel, which is 3 pieces of 3x3 uplink tile in the case of optional PUSC or 3 pieces of 4x3 uplink tile in the case of PUSC.
The acknowledgement bit of the n-th ACK channel shall be '0' (ACK) if the corresponding downlink packet has been successfully received; otherwise, it shall be '1' (NAK). This 1 bit is encoded into a length 3 codeword over 8-ary alphabet for the error protection as shown in Table xx.

Table xx – ACK channel subcarrier modulation

ACK 1-bit symbol	Vector Indices per Tile Tile(0), Tile(1), Tile(2)
0	0, 0, 0
1	4, 7, 2

The UL ACK channel is orthogonally modulated with QPSK symbols. Let $M_{n,8m+k}$ ($0 \le k \le 7$) be the modulation symbol index of the k-th modulation symbol in the m-th uplink tile of the n-th UL ACK channel. The possible modulation patterns composed of $M_{n,8m}$, $M_{n,8m+1}$, … , $M_{n,8m+7}$ in the m-th tile of the n-th UL ACK channel are defined in Table aa.

Table aa—Orthogonal Modulation Index in UL ACK Channel

Vector index	$M_{n,8m}$, $M_{n,8m+1}$, …, $M_{n,8m+7}$
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

$P0 = \exp(j \cdot \frac{\pi}{4})$,

$$P1 = \exp(j \cdot \frac{3\pi}{4}),$$

$$P2 = \exp(-j \cdot \frac{3\pi}{4}),$$

$$P3 = \exp(-j \cdot \frac{\pi}{4}).$$

$M_{n,8m+k}$ is mapped to UL ACK channel tile as shown in Figure bb1 for PUSC uplink subchannel and in Figure bb2 for optional PUSC uplink subchannel. An UL ACK channel is mapped to half subchannel composed of 3 tiles.

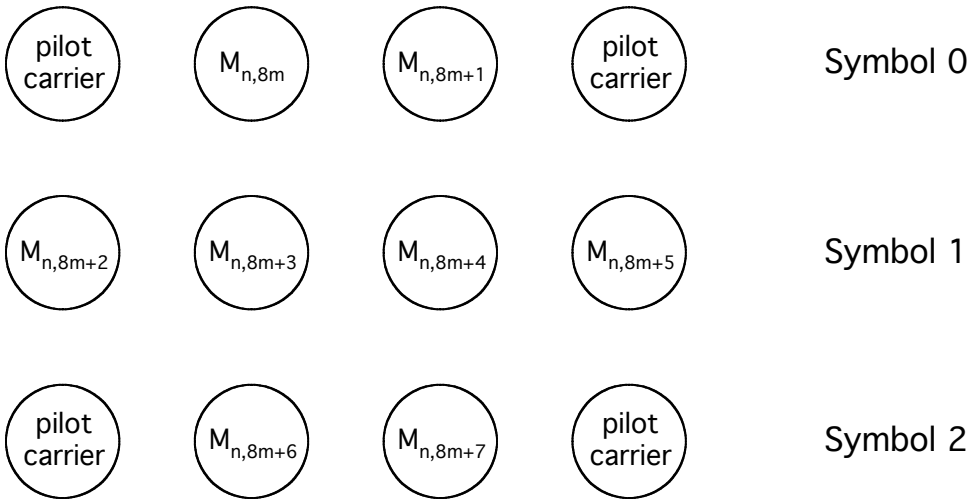

Figure bb1—Subcarrier mapping of UL ACK modulation symbols for PUSC

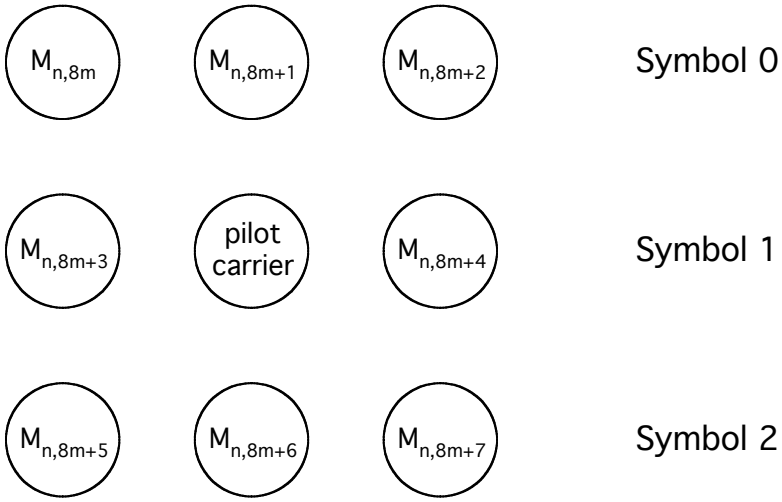

Figure bb2—Subcarrier mapping of UL ACK modulation symbols for optional PUSC