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Title	**Clarification on the allocation for beamformed pilots**
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Re:	
Abstract	Enable closed-loop MIMO channel estimation using partially beamformed midamble
Purpose	Adoption of proposed changes into P802.16e ~~Crossed-out indicates deleted text,~~ underlined blue indicates new text change to the Standard
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Clarification for the Allocation of Beamformed Pilots

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1 Introduction

Dedicated pilot for MIMO beamforming mode is accepted by the D5a standard in November meeting. The dedicated pilots are beamformed to send enhanced training signals for the beamformed spatial channels to one or multiple subscriber stations, and other unintended stations usually can not receive them correctly. According to section 8.4.8.3.1 in D5a, a pilot has to be assigned for each BS antenna. However, this is not necessary and efficient for the dedicated pilot case defined in section 8.4.5.3.4 because only the beamformed spatial channel carrying data needs a pilot. For example, a 4x2 link with 4 BS transmit antennas and 2 SS receive antennas can send at most 2 spatial streams. The BS doesn't need to send pilots for its 4 antennas while it employs dedicated pilots for the beamformed spatial channels. Therefore, the BS only need to send pilots for at most 2 (rather than 4) spatial channels using the pilot allocation defined in section 8.4.8.3.1. This not only reduces pilot overhead but also improves channel estimation at the SS. An example is shown in Figure 1.

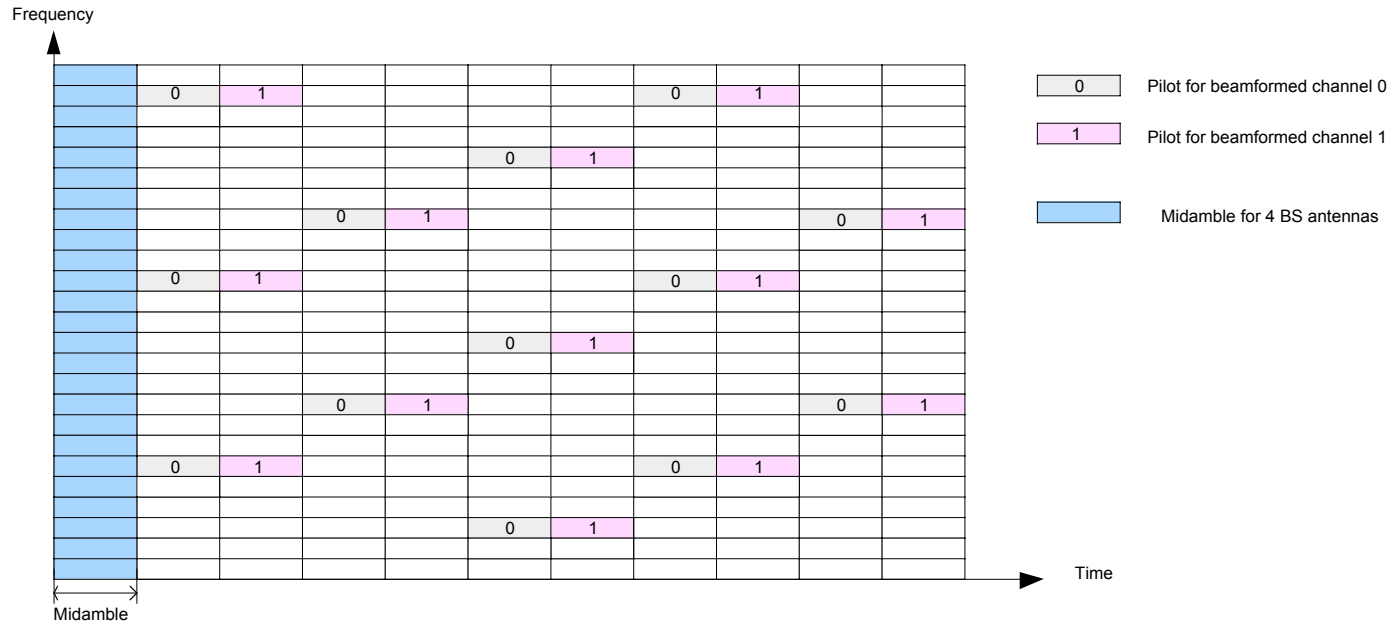

Figure 1 Illustration of a non-beamformed midamble from 4 BS antennas and beamformed pilots for 2 spatial channels.

2 Specific Text Changes

Added at the end (i.e., line 45) in section 8.4.5.3.4 on page 237 of [1] as follows

When the data allocations are transmitted over m beamformed spatial channels and the Dedicated Pilots bit is set to 1, the dedicated pilots are sent only over the m beamformed spatial channels that carry data.

References:

[1] IEEE P802.16e/D5a Air Interface for Fixed and Mobile Broadband Wireless Access Systems – Amendment for Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands, 2004.