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Title	**Common and dedicated pilots in a resource block for MIMO systems**	
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Re:	IEEE 802.16m-08/005 ("Call for contributions on Project 802.16m SDD") Target topic: "Pilot structures as relevant to downlink MIMO"	
Abstract	This contribution provides the design aspect of downlink common and dedicated pilot pattern in terms of 802.16m pilot structures as relevant to downlink MIMO	
Purpose	For discussion and approval by IEEE 802.16 Working Group	
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Common and dedicated pilots in a resource block for MIMO systems

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Introduction

In this contribution, we propose downlink MIMO common and dedicated pilots in a resource block to enable the other MSs to measure their own channels and also reduce the pilot density for data estimation.

In order to reduce the signaling overhead, dedicate pilots are preferred for MU-MIMO. The use of dedicated pilots improves the dedicated MS's performance, but the price is other MS's performance degradation. The reason is that other MSs can not estimate their own channel by using these dedicated pilots, and they can only estimate their own channel by using common pilots. With this consideration, we propose to use dedicated pilots and common pilots simultaneously in one resource block. In order to seamlessly support SU-MIMO schemes and keep the same pilot overhead as the legacy system, the pilot location of MU-MIMO is assumed as the same as that of current SU-MIMO and the total number of dedicated pilots and common pilots is also kept the same as that of current SU-MIMO. The details are shown in below.

Hybrid common and dedicated Pilots in a resource block

Since the pilots allocation and resource block has not been decided in 802.16m, we assume the AMC zone is used for downlink multi-user MIMO with high priority [3]. The basic resource unit is 'bin' which has 9 contiguous subcarriers, as shown in Figure 1. In this case, a slot consists of 2 bins over 6 OFDM symbols [1].

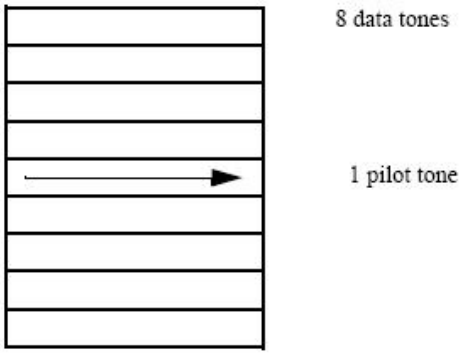

Figure 1. Bin structure.

In the following we'll show an example to explain the pilot design. Assume there are total 2 Tx & 2 Rx antennas $N_t = 2, N_r = 2,$, and two layer of data being distributed such as one layer of data for each user $N = 2$. So there are two users, and assume each user is equipped with $M = 1$ Rx antenna. Figure 2 shows the pilot allocations in this case, from which we can see that *k*-/*p*-/*q*-th subcarriers are occupied by pilots.

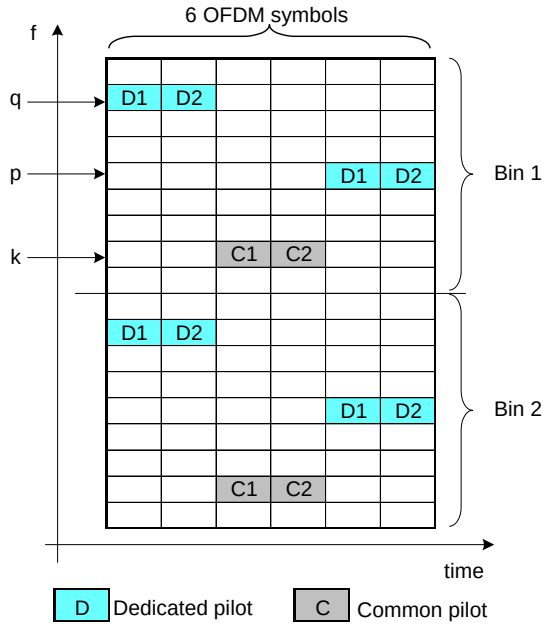

Figure 2. Pilot allocations in case of $N_t = 2, N_r = 2, N = 2, M = 1$.

When common and dedicated pilots are utilized in one resource block, the common pilots can be used to enable other MSs to measure their own channel and the hybrid dedicated and common pilots can be used for data stream estimation which may further reduce the pilot density. We propose to use it for MU-MIMO and SU-MIMO systems.

Proposed Text for SDD

Insert the following text into Physical Layer sub-clause:

---------- Text Start ----------

11.x Pilot structures for DL

11.x.x Common and dedicated pilots for downlink MIMO

Common pilots and dedicated pilots should be in one resource block for multi-user MIMO and single-user MIMO.

---------- Text End ----------

References

[1]. WiMAX Forum™ Mobile System Profile Release 1.0 Approved Specification (Revision 1.4.0: 2007-05-02).