

Recommendation of Downlink Subframe Control Channel Structure

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Fan Wang, Bishwarup Mondal, Amitava Ghosh,
Mark Cudak, Fred Vook, Tim Thomas, Anup Talukdar
Motorola

E-mail: fanw@motorola.com

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TGm Call for comments on SDD, IEEE 802.16m-08/005, in the area of “Downlink Control Structures”

Base Contribution:

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Purpose:

Description of what specific action is requested of the 802.16 Working Group or subgroup.]

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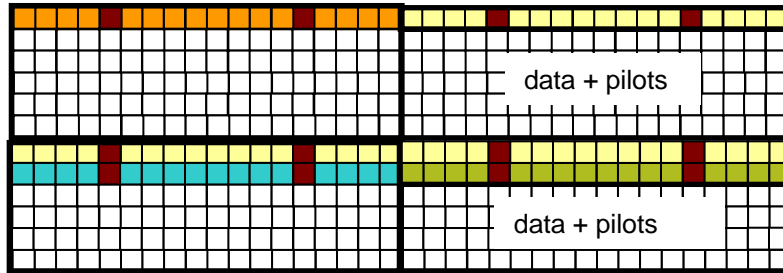
<<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <<http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>.

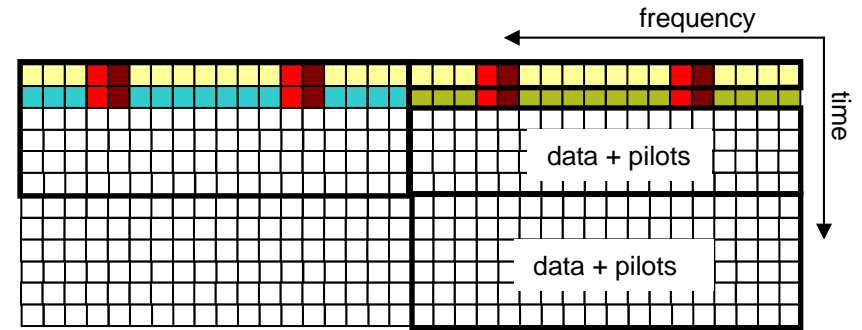
DL Subframe Control Channel Design Proposal

- DL subframe control channel used for
 - ➔ DL allocation and UL grant
 - ➔ Conveying MIMO, redundancy version for HARQ etc.
 - ➔ Indicating pilot format for data resource blocks
- DL subframe control channel transmission supports
 - ➔ Beamforming
 - ➔ **Dedicated pilots which are used to beam-form the control channel**
 - ➔ SFBC and Precoder Based Beamforming
 - ➔ **Common pilots are used for this purpose**
 - ➔ Subframe Bundling
 - ➔ **Multiple subframes share one control channel**
 - ➔ **Reduces overhead**
 - ➔ **Increases coverage**
 - ➔ Microsleep
 - ➔ **Control channel is TDM'd thus saving battery life**
- DL subframe control channel structure
 - ➔ Control channel is per-user based
 - ➔ **Can be power controlled and Beam-formed**
 - ➔ **Connection ID is implicit by exclusively OR'ing it with the CRC**
 - ➔ Control channel is organized into time-frequency resource quanta called control mini-tile (CMT)
 - ➔ Each CMT may contain either dedicated or common pilots
 - ➔ One or multiple CMTs are concatenated to send control information to a user
 - ➔ **Concatenation of multiple CMTs to reduce coding rate and thus increasing coverage**

Subframe Control Message



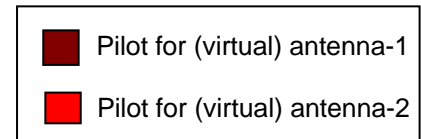
Ex: 1 or 2 baud control for 1 subframe, supporting 1 virtual antenna



Ex: 2 baud control for 2 subframes, supporting 2 virtual antennas

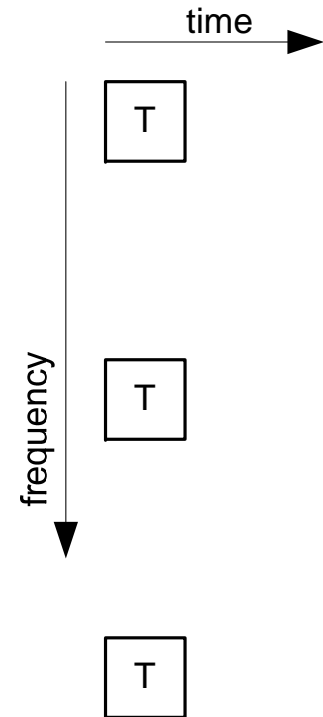
•TDM control and data regions

- ➔ Control Mini-Tiles (CMT) as building block for control channel
 - ➔ **Dedicated pilots used to beam-form subframe control channel**
 - ➔ **Common pilots used for SFBC, Pre-coding or measurement purposes**
- ➔ Flexible # of OFDM symbols for control varied based on system load, MS location etc.
 - ➔ **Lower overhead compared to fixed size control**
 - ➔ **Allow multiple OFDM symbols for control to improve cell coverage**
- ➔ Enable Microsleep to save MS power
 - ➔ **After reading control information on the DL, turning off RF functions until the next control channel**
 - ➔ **Enhanced micro sleep with subframe grouping [Motorola, C80216m-08_008.pdf]**
- ➔ Small buffer requirements and minimum data decoding lag
- ➔ Subframe grouping [Motorola, C80216m-08_008.pdf]
 - ➔ **Reduced control overhead**
 - ➔ **Enhanced micro sleep**



Subframe Control Channel and CMT

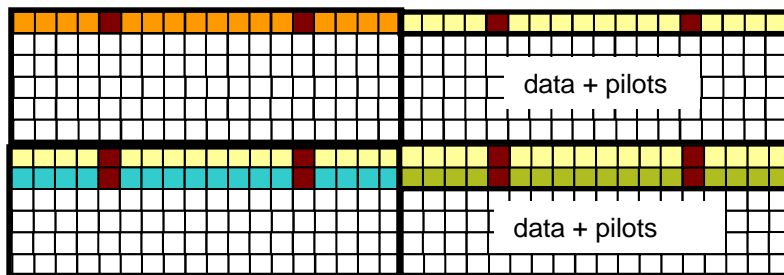
- CMT is the minimum building block of subframe control channel
- CMT size is same as two bins of WiMAX AMC: 18 subcarriers x 1 symbol
- Multiple CMT forms one control channel
 - ➔ distributed in frequency
- Support user-specific beamforming, power control, FFR, MCS
- Enable blind decoding of control information by the MS with limited complexity
- Support multiple virtual antennas (to enable SFBC, beamforming)



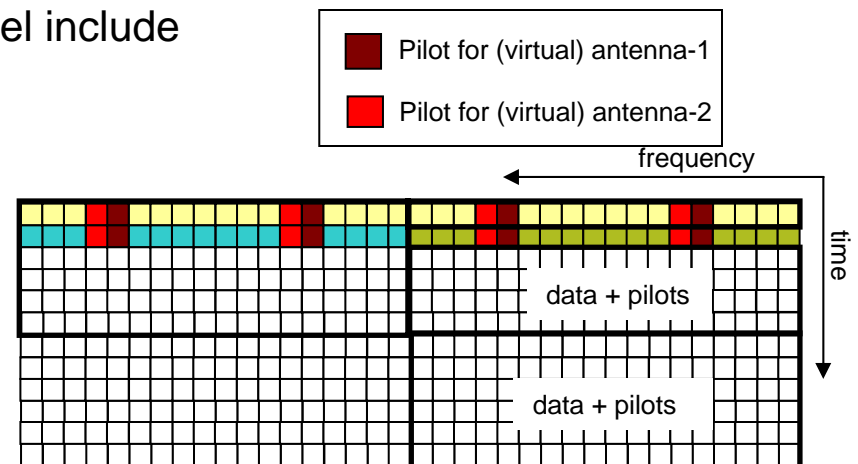
Proposed Text to 16m SDD (Section 11 --- PHY)

• 11.x Downlink subframe control channel

- ➔ Subframe control channel conveys DL Allocation, UL Grant, Pilot Format for data region
- ➔ DL subframe control channel is TDM'd with DL data within a subframe
- ➔ Subframe control channel is made up of multiple control channel mini tile (CMT)
 - ➔ One CMT contains 18 subcarriers by 1 OFDM symbol
- ➔ Transmission schemes for subframe control channel include
 - ➔ Beamforming, SFBC, CDD, Precoding etc
- ➔ CMT permutation
 - ➔ Distributed
- ➔ Pilot format for subframe control channel include
 - ➔ Common pilot
 - ➔ Dedicated pilot



Ex: 1 or 2 baud control for 1 subframe, supporting 1 virtual antenna



Ex: 2 baud control for 2 subframes, supporting 2 virtual antennas