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Title	Details of SDD Section 11.9.2.1 Uplink Fast Feedback Channel
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Re:	SDD Session 56 Cleanup, Call for PHY Details
Abstract	This is revised version of Section 11.6 of IEEE 802.16m-08/003r4. This document provides further physical layer details.
Purpose	Draft for further development of the IEEE 802.16m SDD
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Details of SDD Section 11.9.2.1 Uplink Fast Feedback Channel

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11.9.2.1 UL Fast Feedback Channel

The UL fast feedback channel carries channel quality feedback and MIMO feedback. Channel quality feedback includes physical CINR and effective CINR feedback. MIMO feedback includes PMI and rank indication. For physical CINR feedback, both mean and standard deviation of per tone CINRs should be feedback. Effective CINR feedback is derived and feedback by a MS to meet a target FER according to the MS receiver design.

The mapping of UL fast feedback information into physical channels is described in Section 11.9.2.1.2.

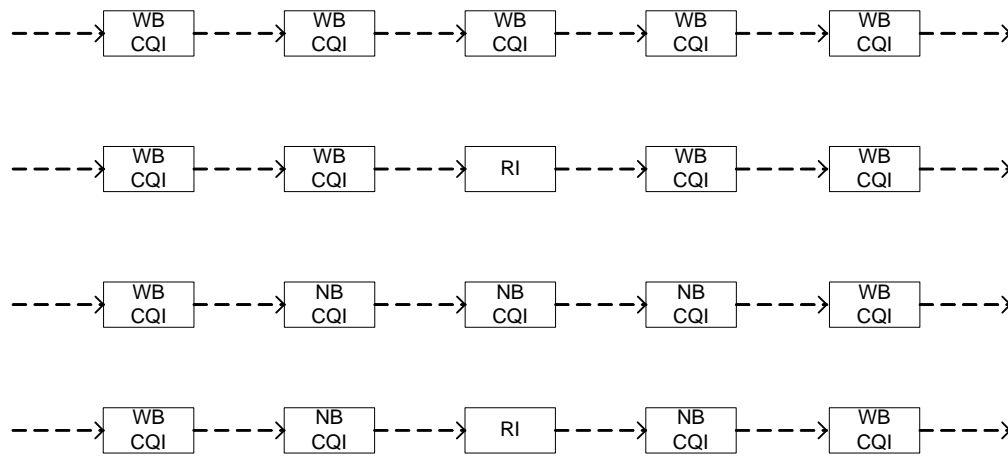
11.9.2.1.1 Multiplexing with other control channels and data channels

The UL fast feedback channel is FDM with other UL control and data channels.

The UL fast feedback channel starts at a pre-determined location, with the size defined in a DL broadcast control message. Fast feedback allocations to an MS can be periodic and the allocations are configurable. For periodic allocations, the specific type of feedback information carried on each fast feedback opportunity can be different. Wideband fast feedback information, narrow band fast feedback information, and rank indication for MIMO feedback can be feedback with different time period (Figure 1). Further, one feedback channel may contain wideband CQI information, narrow band CQI information, PMI, rank indication or a mixture of them.

For Event driven feedback information, they are transmitted through UL inband control channel following the allocation message from the BS.

- Deleted:** Transmission of other feedback information on the UL fast feedback channel is FFS.¶
- Deleted:** The UL fast feedback channel is classified into multiple logical channels per user.
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Figure 1. UL Fast Feedback Channel Timing Diagram (example)

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The UL fast feedback channel carries one or more types of fast feedback information. Multiplexing fast feedback channels from multiple users is described in Section 11.9.2.1.2.

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11.9.2.1.2 PHY structure

Transmission on the fast feedback channel can be periodic or event-driven. Event driven fast feedback is triggered by BS signaling and the information is transmitted with UL data channel as inband control signaling.

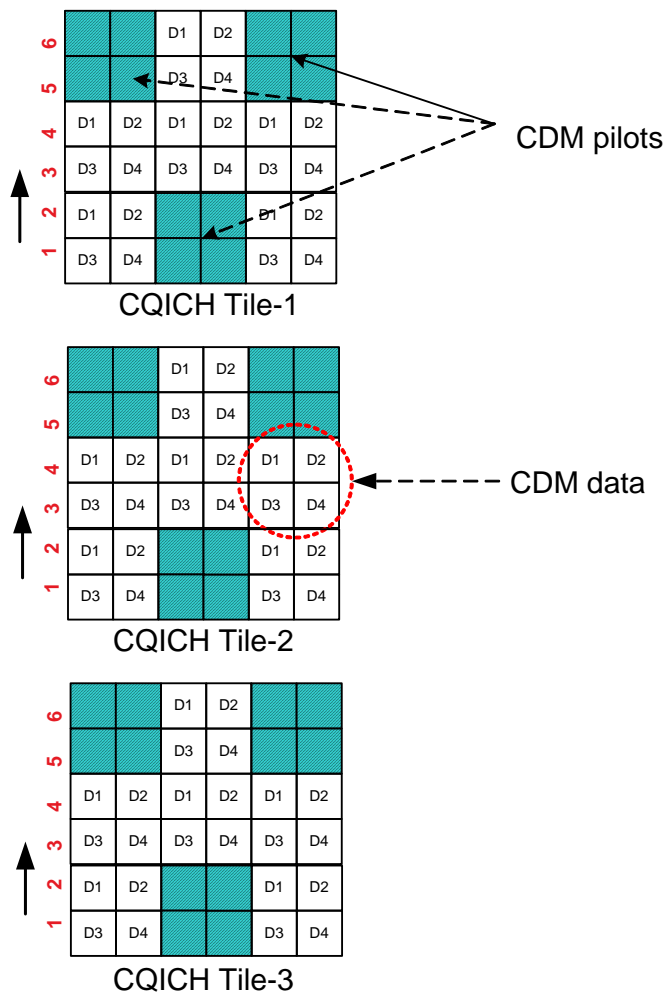
The transmission format can be adaptive.

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Periodic fast feedback information that is transmitted on UL fast feedback channel is QPSK modulated with coding rates depending on number of information bits in the CQI feedback. Further, transmit power of fast feedback channel is adaptively adjusted to the channel fading according to UL power control.

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Four UL fast feedback channels are multiplexed together using a mixture of FDM/TDM/CDM in three UL DRU tiles. For each group of four tones that are adjacent in time and frequency, pilot and data symbols from four fast feedback channels are CDMed together in order to take full advantage of the MS transmit power. Further, since these four tones are adjacent in time and frequency, orthogonal codes can be used to separate the four fast feedback channels. Finally, multiple groups of four tones are allocated in each tile with FDM/TDM. The pilot and data tone allocations are shown in Figure 2.

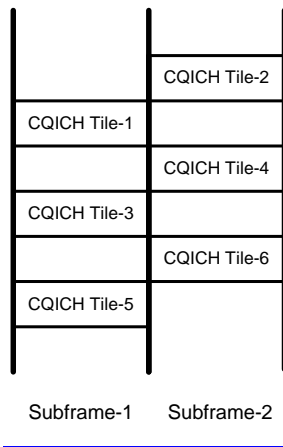


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Figure 2. UL Fast Feedback Channel Pilot and Data Tone allocations

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In order to improve the coverage of fast feedback channel for cell edge MSs, the UL fast feedback tiles are allocated in time dimension first as shown in Figure 3. Further, subframe based frequency hopping of the tiles can be applied to improve the frequency diversity.



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Figure 3. UL Fast Feedback Channel Pilot and Data Tone allocations

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