

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >
Title	Proposed Text for UL Sounding Channel in the UL Control Structure Section for the IEEE 802.16m Amendment
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Re:	“802.16m amendment text”: IEEE 802.16m-08/053r1, “Call for Contributions on Project 802.16m Draft Amendment Content”. Target topic: “11.9 UL PHY control structure, especially mapping”.
Abstract	The contribution proposes the text of UL control structure section to be included in the 802.16m amendment.
Purpose	To be discussed and adopted by TGm for the 802.16m amendment.
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Proposed Text for UL Sounding in the UL Control Structure Section (15.9.2 UL Control Channels) for the IEEE 802.16m Amendment

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1. Introduction

The contribution proposes the text for uplink sounding contained in the UL PHY Control structure section to be included in the 802.16m amendment. The proposed text is developed so that it can be readily combined with IEEE P802.16 Rev2/D8 [1], it is compliant to the 802.16m SRD [2] and the 802.16m SDD [3], and it follows the style and format guidelines in [4].

2. Reference to the SDD [2]

The text proposed in this contribution is based on subclauses 11.9.1.2 (MIMO Feedback), 11.9.2.1 (UL Fast Feedback Channel) and 11.8.2.2.3.2 (CSI Feedback) in the IEEE 802.16m SDD [3].

3. References

- [1] IEEE P802.16 Rev2/D8, "Draft IEEE Standard for Local and Metropolitan Area Networks: Air Interface for Broadband Wireless Access," Oct. 2008.
- [2] IEEE 802.16m-07/002r7, "802.16m System Requirements"
- [3] IEEE 802.16m-08/003r6, "The Draft IEEE 802.16m System Description Document"
- [4] IEEE 802.16m-08/043, "Style guide for writing the IEEE 802.16m amendment"

4. Text proposal for inclusion in the 802.16m amendment

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15. Advanced Air Interface

15.9.2 UL Control Channel

15.9.2.1. UL Sounding Channel

The UL sounding channel is used by an MS to send a sounding signal for MIMO feedback, channel quality feedback and acquiring UL channel information at the BS.

15.9.2.1.1. UL Sounding Channel Definition

The UL Sounding channel consists of all usable subcarriers within the Sounding Symbol, which is the last OFDM symbol of a 7-symbol UL subframe. No more than one Sounding Symbol can exist in a subframe. The number of sounding symbols in a super frame is TBD. The Sounding Symbol is partitioned in frequency into adjacent non-overlapping Sounding Resource Units (SRU), where an SRU is 18 physically adjacent OFDM subcarriers. The methodology for indicating the presence of a sounding symbol is TBD.

To improve the coverage performance of the sounding channel, the sounding channel can alternatively be configured to be distributed over several OFDM symbols within a subframe in a TBD manner.

15.9.2.1.2. Sounding Signaling Methodology

Sounding Request/Response: Two information elements are defined for enabling UL Channel Sounding, the Sounding Request and the Sounding Response. The Sounding Request commands a MS to transmit a Sounding Response on one or more Sounding Allocations within the Sounding Channel, where a sounding allocation is a specified set of Sounding Resource Units within the Sounding Symbol.

Sounding Request Location: The Sounding Request can be contained in an independent control message in the user-specific-control-header. The Sounding Request can also be piggybacked in a downlink data allocation assignment.

Support for Persistent Sounding: The sounding request can set up a persistent sounding response in which the MS will periodically transmit its sounding response at some defined periodicity interval. The sounding request can also terminate the persistent sounding response. The methodology used to setup and tear down persistent sounding is patterned after the methodology used for persistent data allocations.

15.9.2.1.3. Sounding Allocation Methodologies

In an UL subframe that contains a sounding channel, an MS may be assigned a sounding allocation that consists of one or more SRUs. The Sounding Feedback Allocation refers to the set of SRUs that are assigned to an MS for transmitting the Sounding Response. With UL channel sounding, multiple MSs or multiple antennas from the same MS may be assigned to the same sounding allocation (set of sounding SRUs), and two forms of multiplexing are supported for multiplexing the multiple transmit antennas on the same SRUs: frequency decimation multiplexing and code-division-multiplexing (CDM).

There are three methodologies for specifying which SRUs belonging to the Sounding Allocation as described in the following:

15.9.2.1.3.1. Downlink Allocation Matched

In the “Downlink Allocation Matched” methodology, the SRUs to be included in a sounding allocation are defined in the same way that the PRUs in a downlink data allocation are defined. The Downlink-Allocation-Matched methodology may be used to enable the MS to transmit the UL sounding waveform on the same physical frequency region that the MS will receive data on.

15.9.2.1.3.2. Uplink Allocation Matched

In the “Uplink Allocation Matched” methodology, the SRUs that belong to a sounding allocation are defined in the same way that the PRUs of an uplink allocation are defined. The Uplink-Allocation-Matched methodology may be used to enable the MS to transmit the UL sounding waveform on the same PRUs that the MS will transmit data on, e.g., in support of codebook-feedback based closed-loop MIMO transmissions on the UL.

15.9.2.1.3.3. Wideband Allocation

In the wideband allocation mode, the sounding allocation consists of all SRUs in the Sounding Symbol. A decimation rate and decimation offset is specified in the sounding request, where a decimation rate of N means every N^{th} subcarrier is occupied by the sounding response starting from the subcarrier corresponding to the decimation offset.

15.9.2.1.4. Sounding Request Specification

The messaging format and contents for the Sounding Request is TBD.

15.9.2.1.5. Sounding Response Specification

For sounding allocations that are Downlink Allocation Matched, a Decimation Rate D of 1, 2, 3 or 6 may be specified to allow multiple MSs or transmit antennas to transmit sounding responses on the same allocations. Each MS or MS transmit antenna may be assigned a unique Decimation offset ($0 \dots D-1$) on which to transmit the sounding response. Alternatively, multiple MSs or transmit antennas may be multiplexed in a CDM fashion.

For sounding allocations matched that are Uplink Allocation Matched, a Decimation Rate D of 1, 2, 3 or 6 may be defined to allow multiple MSs or transmit antennas from the same MS to transmit sounding responses on the same sounding allocations. Each MS or transmit antenna would be assigned a unique Decimation offset ($0 \dots D-1$) on which to transmit the sounding response. Alternatively, multiple MSs or transmit antennas may be multiplexed in a CDM fashion.

The sounding sequence values are TBD. The sounding sequence used in a sector of a cell shall be different from the sounding sequence used in a sector of an adjacent cell.

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