

MIMO Strategies for the IEEE 802.16m Uplink

Document Number:

IEEE S802.16m-08/608

Date Submitted:

2008-07-07

Source:

Fred Vook, Bishwarup Mondal, Fan Wang,
Bill Hillery, Mark Cudak, Amitava Ghosh
Motorola

E-mail: fred.vook@motorola.com

*<http://standards.ieee.org/faqs/affiliationFAQ.html>>

Venue:

TGm – Call for contributions on Project 802.16m System Description Document – IEEE 802.16m-08/024 (Uplink MIMO Schemes)

Base Contribution:

IEEE C802.16m-08/608

Abstract:

Methodologies for supporting MIMO and Advanced Antenna Array Technology for the IEEE 802.16m uplink.

Purpose:

Discussion and adoption of recommended text into 802.16m System Description Document

Notice:

This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the “Source(s)” field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.

Release:

The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE’s name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE’s sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

Patent Policy:

The contributor is familiar with the IEEE-SA Patent Policy and Procedures:

<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>>.

UL MIMO Schemes for IEEE 802.16m: Contents

- Overall Theme:
 - Preserve and expand on key UL-MIMO features already in the legacy IEEE 802.16e system
 - Support advanced CPE and laptop devices with two transmit antennas and more TX power than typical handset devices

MS Antenna Configurations Supported for UL-MIMO

- Mobile Handset / CPE
 - 1Tx, 2Rx
- MS/CPE with Switched Diversity
 - 1Tx, MRx
 - Single PA with switched TX diversity on UL
- Mid-tier CPE
 - 2Tx, MRx
- High-tier CPE / Laptop
 - 4Tx is FFS

Outline of methods

- Single User Transmission
 - SIMO & MIMO with switched diversity
 - Open-Loop STC/MIMO
- Multiple User Transmission
 - Collaborative Spatial Multiplexing / RX-SDMA

Single-User Transmission “Open-Loop” Methods

- Traditional SIMO
 - Enable switched Tx diversity from MS with multiple TX antennas but only one PA
 - Necessary features to support this are FFS
- STC / TX diversity for MSs with 2Tx antennas
 - Matrix A/Alamouti
- Open-Loop MIMO for MSs with 2Tx antennas
 - Matrix B vertical/single codeword open-loop MIMO

Collaborative Spatial Multiplexing / Receive Spatial Division Multiple Access

- Multiple users sharing a time-frequency resource on the UL
- Supported in legacy system for up to 2 users
- 16m should support up to four simultaneous layers / streams
 - Four single-antenna MSs
 - Two double-antenna MSs each transmitting Matrix A or Matrix B
 - One double-antenna MSs (Matrix A or Matrix B) with one or two single-antenna MSs

Proposed Table of Contents: UL MIMO Schemes

(See C802.16m-08/608 for more details)

- 11.8 – Uplink MIMO Schemes
 - 11.8.1 MS Antenna Configurations Supported for UL-MIMO
 - Mobile Handset/CPE: 1 transmit antenna, 2 receive antennas
 - Switched Diversity MS/CPE: 1 transmit antenna, M receive antennas
 - Mid-Tier CPE: 2 transmit antennas, M receive antennas
 - High-Tier CPE: 4 transmit antennas, M receive antennas (FFS)
 - 11.8.2 Single-user methods
 - SIMO and SIMO with switched TX Diversity
 - Two-antenna Open-Loop STC (Matrix A)
 - Two-antenna Open-Loop MIMO (Matrix B, single codeword)
 - 11.8.3 Multi-user methods (Collaborative Spatial Multiplexing)
 - Up to four single-antenna MSs can be multiplexed in one uplink allocation.
 - Two two-antenna MSs can be multiplexed in one uplink allocation where each two-antenna MS employs two-antenna open-loop STC or two-antenna open-loop single-codeword MIMO.
 - One two-antenna MS and one or two single-antenna MSs and can be multiplexed, where the two-antenna MS employs two-antenna STC or two-antenna open-loop MIMO.