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MIMO SPACE-TIME BLOCK CODES AND CHANNEL ESTIMATION FOR MOBILE WIMAX DL-PUSC

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Abstract. *High-speed mobility, high data throughput, and flexibly scalable architecture are some of the key advantages of mobile WiMAX (Worldwide interoperability for Microwave Access) or wireless metropolitan area network, which is now being considered as the initiation of the next generation wireless network. Recently, multiple-input multiple-output (MIMO) techniques, especially the mature Space-Time Block Codes (STBC) scheme, have attracted lots of interest for increasing both transmission capacity and quality. Although MIMO for OFDM systems was intensively studied in literatures, published works usually demonstrate the system performance with a perfect knowledge of channel while channel estimation plays a very important role in determining the real performance. This paper aims to apply MIMO-STBC with a novel channel estimation method to the Downlink-Partial Usage of Subchannels (DL-PUSC) mode of the mobile WiMAX system to study the system performance more practically. Performance analysis is carried out by simulating the system in many mobile channel models recommended by ITU and COST259. The results show that MIMO-STBC in 802.16e DL-PUSC provides a great improvement over the single-input single-output (SISO) approach and the new channel estimation method enhances the performance further. Up to 15 dB gain with STBC and 1-3 dB more with the new channel estimation scheme are achieved.*
Keywords: IEEE 802.16e, WiMAX, DL-PUSC, MIMO, Alamouti, MRC, Channel estimation

1. **Introduction.** IEEE 802.16e, commercially known as mobile WiMAX, is a technology that provides broadband wireless access in mobile environment over a large area. Using the scalable orthogonal frequency division multiple access (OFDMA) technique, mobile WiMAX not only inherits the strength of mitigating the impairment of multipath frequency-selective fading channel, but it also allows flexibly multiplex data streams from many individual users. Hence, system bandwidth is utilized very efficiently. The operating bandwidth can vary from 1.25 MHz to 20 MHz by changing the OFDM symbol size from 128 to 2048. By subchannelizing the OFDM symbol, assigning each user a group of subchannels, and permuting them together over the OFDM symbol, this system ensures that data of a particular user are not affected from other severely faded channels.

DL-PUSC, as specified in [1], is one of the multiple access modes for downlink direction which is widely used for performance analysis. This scheme divides the OFDM symbol into subchannels and assigns them to users/subscribers. Each subchannel is further partitioned into groups of 14 consecutive subcarriers called clusters. Clusters of one user are not continuously connected but are pseudo-randomly permuted over the OFDM symbol