ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

MOBILE WIMAX SYSTEM'S COMPUTER SIMULATION AND FIELD EXPERIMENT FOR DOWNLINK MULTIUSER MIMO

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ABSTRACT

This paper of Computer Simulation and Field Experiment for Downlink Multiuser MIMO in Mobile WiMAX System overviewed the Current issues regarding the WiMAX System of today. The transmission performance for a downlink mobile WiMAX system with multiuser multiple-input multiple-output (MU-MIMO) systems in a computer simulation and field experiment is described. We Can Say that In computer simulation, a MU-MIMO transmission system can be realized by using the block diagonalization (BD) algorithm, and each user can receive signals without any signal interference from other users. The Paper is explaining the major contents regarding the the bit error rate (BER) performance and channel capacity in accordance with modulation schemes and the number of streams were simulated in a spatially correlated multipath fading environment. Furthermore, paper propose a method for evaluating the transmission performance for this downlink mobile WiMAX system in this environment by using the computer simulation Effectively the major issue of It was confirmed that the experimental mobile WiMAX system for MU-MIMO transmission successfully increased the total channel capacity of the system.

KEYWORDS: MIMO, WiMAX System, simulation.

INTRODUCTION

Introduce the topic and your rationale for addressing this topic focusing on why this topic is important. Clearly define exactly what this article will discuss, outline the order in which you will discuss each subtopic to give the reader any background information needed to understand the coming sections. There are some problems during the condition monitoring and fault diagnosis of the reciprocating pump when it is working. Many researchers have reported field experimental results with the 3.5-GHz frequency band [4, 5]. The 2.5-GHz frequency band has been allocated in Japan, and an experimental mobile WiMAX system was developed in Azumino City in Japan [6, 7]. A network service and applications have been provided to citizens within the local wireless network area. Base stations (BSs) complying with the mobile WiMAX Based on IEEE802.16e standard [8] were istalled in 2009 and 2010 to increase the channel quality and channel capacity of the system. As previous work, the basic throughput performance in a field experiment under a static condition of MUMIMO transmission with the mobile WiMAX system was reported [9], and the RSSI and throughput performances within 500m from the BS were measured [10].

Downlink MU-MIMO System Model

The model with MU-MIMO technique is shown in Figure 1. denotes the number of transmitting antennas at the base station, and denotes the number of receiving antennas at a user. The maximum number of transmitting streams is 3; therefore, the number of users is 1-3 in the computer simulation. In this paper, we assumed that the MU-MIMO system is based on the OFDM system and that the subcarriers are influenced by flat fading through Channels.

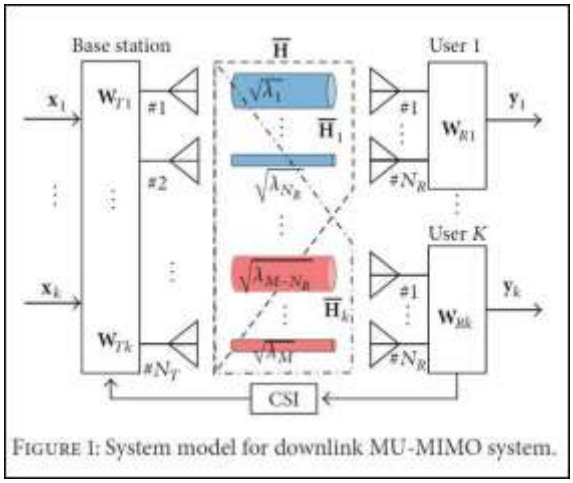

FIGURE 1: System model for downlink MU-MIMO system.

Note that the above MU-MIMO transmission with BD algorithm can transmit signals only to the desired user without any interference between users under independently identically.

Computer Simulation

Simulated Condition: To evaluate the system performance, we carried out a computer simulation by using downlink MU-MIMO system The Parameter is shown in table in the reference paper. Also the various techniques of the simulation is discuss in reference paper but the most effective one is the Channel Capacity Analysis.

The total channel capacity on the MU-MIMO systems increased as the number of transmitting antennas and streams increased. Shown in the figure 2.

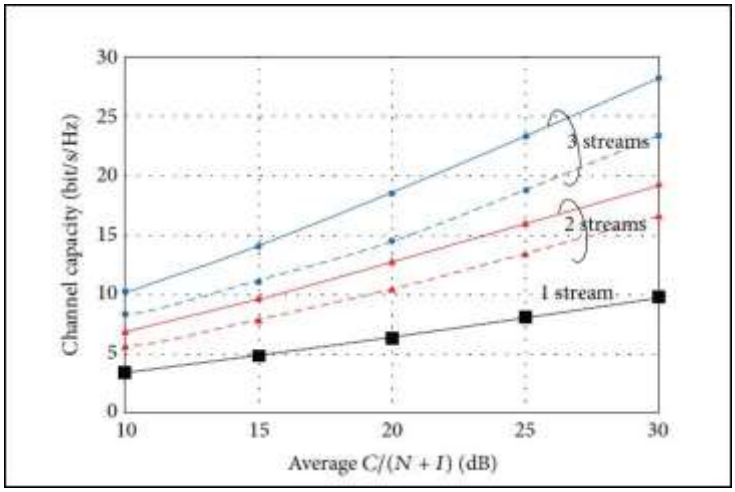

Figure 2: Channel capacity in accordance with spatially correlation and number of streams.

To evaluate the transmission performance for the MU-MIMO system in a spatially correlated environment, we propose an evaluation method that uses computer simulation. Here, we calculated the transmission speed for the downlink mobile WiMAX system in order to evaluate the throughput performance in the field experiment described in Section 4.The downlink bandwidth is 10MHz and the number of downlink subcarriers for data transmission is 720, so the downlink bandwidth for data transmission is 720/1024 × 10MHz = 7.0MHz. The maximum transmission speed for only 1 user in downlink is calculated as 16.17Mbps as per reference paper [1]. In the field experiment, we used the simulated results of 16.17Mbps for 1 stream and 27.4 Mbps for 2 streams for the evaluation because the maximum number of streams for the experimental mobile WiMAX system was 2.

Field Experiment

Figure 3 shows *Overview of Experimental Mobile WiMAX System.*

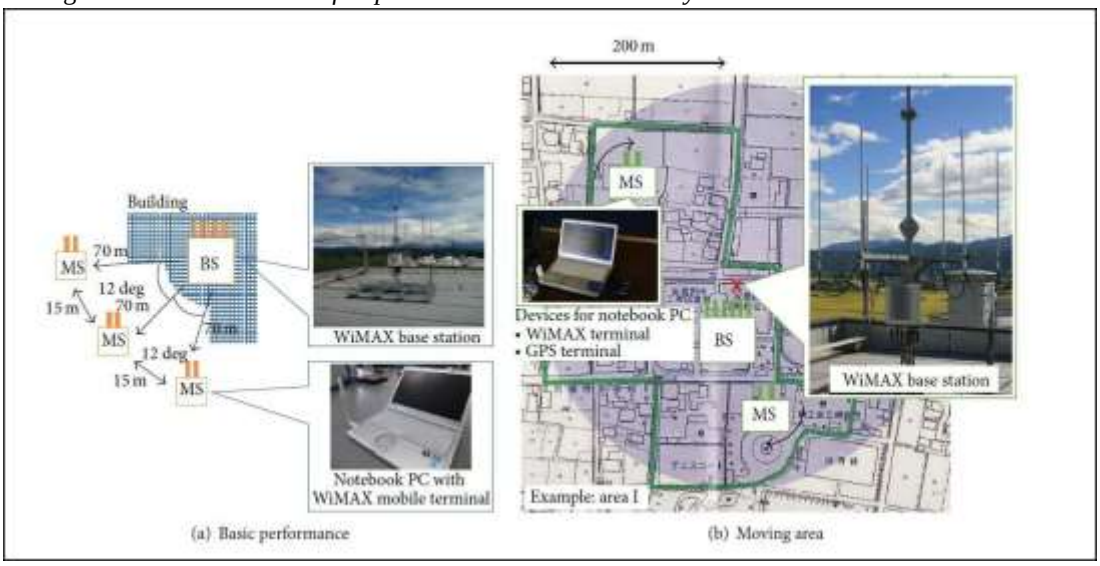

Figure 3: Setup for field experiment.

In the network area of the system, we measured the received power and the throughput performances for MU-MIMO transmission within 200−500 m centering on the BS. A WiMAX BS complying with IEEE 802.16e was used, And the parameters are listed in Table 1. The frequency was 2587MHz, which is an open frequency band for local communities, and the bandwidth was 10MHz and called the "local band." The frame structure was OFDMA/TDD, and its interval was 5ms, which was decided by the system profile of the mobile WiMAX. The ground height of the BS was about 17 m. Here, CSI feedback was transmitted fromtheMSs to the BS by using the codebook algorithm [19]. Note that the downlink maximum throughputs in the physical layer calculated in the above section were 16.2 Mbps and 27.4 Mbps when the numbers of streams were 1 and 2, respectively.

The maximum measured throughputs were 13 Mbps and 23 Mbps in the UDP layer; therefore, the throughputs for only 1 and 2 streams were almost the same values as the simulated throughputs in Section 3.3. Furthermore, the MU-MIMO system with 2 streams has twice the throughput performance as compared with that with 1 stream if the system can eliminate interference between signals for the other users perfectly. Although there was some interference between the users, the total throughput performance with 2 streams can be improved by the beam forming in all areas. Therefore, it was confirmed that the MU- MIMO transmission system based on the mobile WiMAX was successfully constructed, and increasing and evaluating the total channel capacity on the system were successfully performed.

CONCLUSION

We proposed a method for evaluating transmission performance for the mobile WiMAX system with MU-MIMO under a spatially correlated multipath fading environment. In the field experiment, the received power and downlink throughput performance were measured by walking around areas. The results show that the maximum downlink throughput with 1 stream was about 13Mbps and the maximum total throughput with 2 streams was about 23Mbps.

Therefore, it was confirmed that MU-MIMO transmission based on mobile WiMAX successfully confirmed increased the total channel capacity of the system. Moreover, the experimental throughput performance could be evaluated correctly by using the proposed evaluation method.

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