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Performance of 2 × 1 (MISO) and 2×4 (MIMO)-OFDM using AWGN Channel

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ABSTRACT

WiMAX technology is a broadband wireless data communications technology based around the IEE 802.16 standard providing high data speed over a world wide area. The word of WiMAX stand for Worldwide Interoperability for Microwave Access, and it is a technology for point to multi-point wireless networking. In this project we are analysis the SISO and MIMO technologies under combination of digital modulation technologies like 2-PSK, 4-PSK, 8-QAM and 16-QAM with communication channel AWGN used and the results shows under the BER to SNR.

Keyword: - AWGN, 2 × 1, 2×4, Modulation, BER, SNR, WiMAX.

INTRODUCTION

WiMAX is an IEEE 802.16 standard based technology responsible for bringing the Broadband Wireless Access (BWA) to the world as an alternative to wired broadband. WiMAX is expected to have an explosive growth, as well as the Wi-Fi, but compared with the Wi-Fi WiMAX provides broadband connections in greater areas, measured in square kilometers, even with links not in line of sight. For these reasons WiMAX is a MAN, highlighting that "metropolitan" is referred to the extension of the areas and not to the density of population and Wireless technology enables high-speed, high quality communication between mobile devices. Potential wireless applications include cell phones, 802.11-based wireless Local Area Networks (LANs), Bluetooth, smart homes and appliances, voice and data communication over the Internet, and video conferencing.
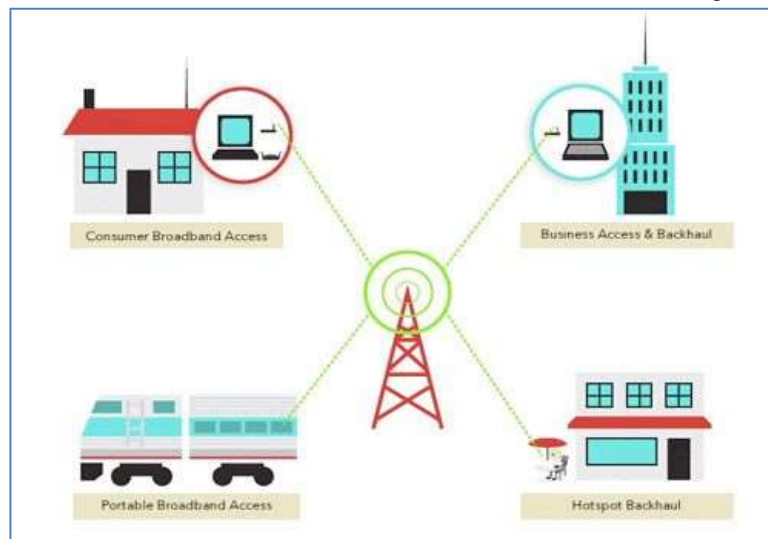

Fig. 1: Architecture of WiMAX Model

The WiMAX technology has a broad range of applications in Fig. 1. First, it provides a wireless alternative to cable and DSL for broadband access for the areas in the United States and throughout the world that still do not have access to broadband connectivity. Using cable or DSL to provide broadband connections to these areas can be very time-consuming and expensive. With WiMAX, broadband service could be installed in just a few days with a significantly lower cost. Because 80% of cell base stations today are connected using expensive fibber optic cables, service providers may consider using WiMAX as a more cost-effective alternative [3].

AWGN CHANNEL

Additive White Gaussian Noise (AWGN) is a channel model in which the only impairment to communication is a linear addition of wideband or white noise with a constant spectral density (expressed as watts per hertz of bandwidth) and a Gaussian distribution of amplitude. The noise is additive, i.e., the received signal equals the

transmit signal plus some noise, where the noise is statistically independent of the signal. The noise is white, i.e., the power spectral density is flat, so the autocorrelation of the noise in time domain is zero for any non-zero time offset. The noise samples have a Gaussian distribution.

PERFORMANCE OF 2×1-MISO SYSTEM

We are used in Additive White Gaussian Noise and modulation schemes used like 2-PSK, 4-PSK, 8-QAM and 16-QAM. The performance of used New scheme Alamouti with combination of MISO and MIMO. The simulation results are shown in figure 2 and 3 with the result analysis table are shown 1.
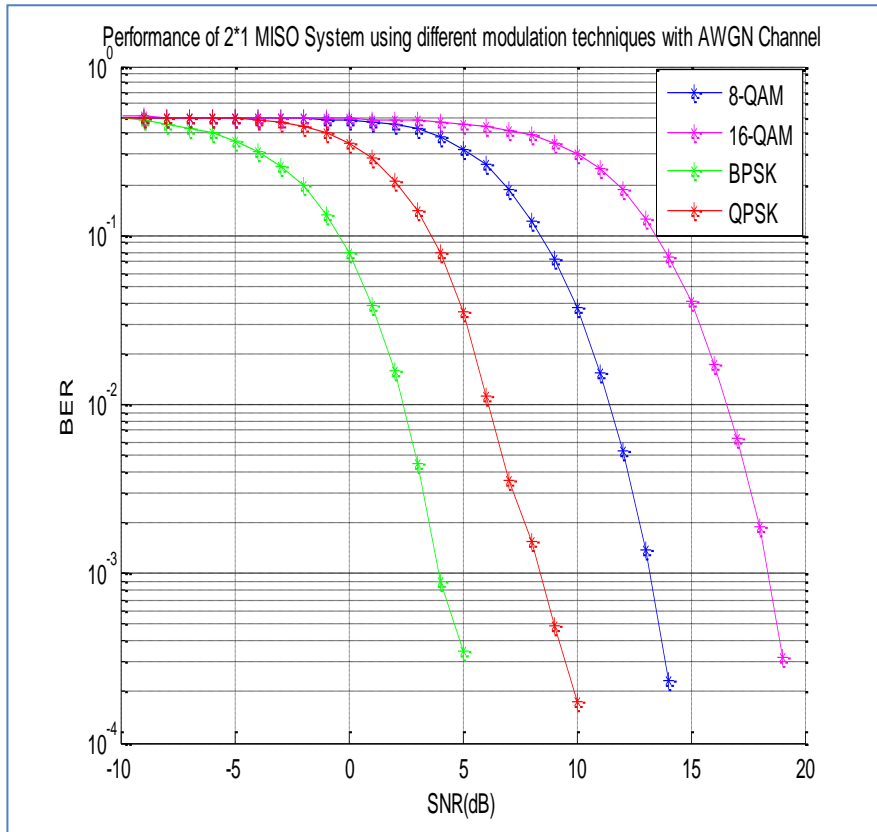

Fig. 2: Performance analysis of 2×1 system with AWGN channel

Table 1: Performance result analysis of 2×1 MISO system

Modulation Techniques	System	BER	SNR
2-PSK	MISO	10^{-3}	03.80
4-PSK	MISO	10^{-3}	08.50
8-QAM	MISO	10^{-3}	13.80
16-QAM	MISO	10^{-3}	17.50

Result Analysis: In this performance, we have used the Alamouti scheme with communication AWGN channel and different modulation techniques. The performance is displayed in figure 2 & 3 in terms of the BER verses SNR logarithmic plot.

PERFORMANCE OF 2×4 MIMO SYSTEM OVER AWGN CHANNEL

In this analysis we are used in AWGN (Additive White Gaussian Noise) and different modulation schemes used like BPSK, QPSK, 8-QAM and 16-QAM.
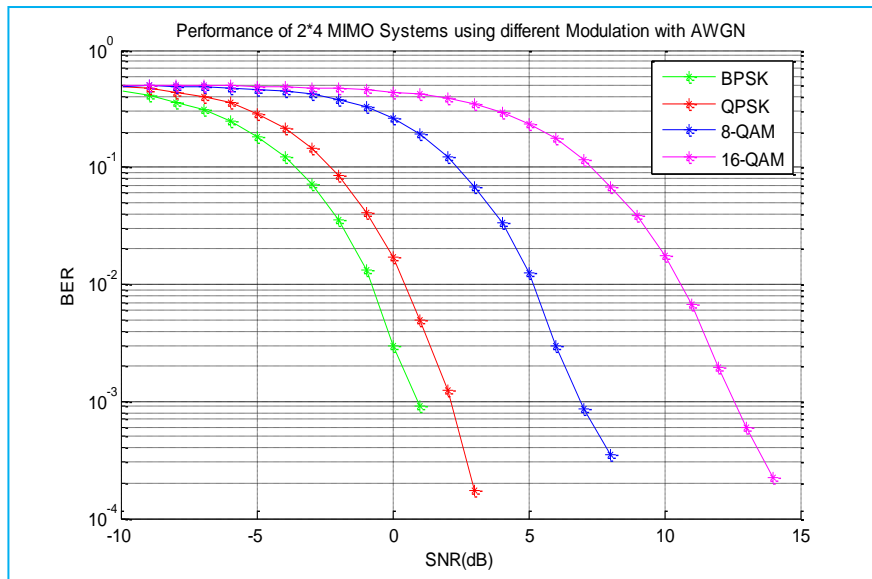
Fig. 3: Performance analysis of 2×4 MIMO system with AWGN channel

The performance of used New scheme Alamouti with combination of MIMO (multiple input and multiple output). The simulation results are shown in figure 5.6 and 5.7, the result analysis are shown in table 2.

Table 2: Performance result analysis of 2×4 MIMO system

Modulation Techniques	System	BER	SNR
2-PSK	MIMO	10^{-3}	01.30
4-PSK	MIMO	10^{-3}	03.00
8-QAM	MIMO	10^{-3}	08.00
16-QAM	MIMO	10^{-3}	13.07

Result Analysis: The performance is displayed in figure 3 in terms of the BER verses SNR logarithmic plot. In the table 2 in this plot we analysis the 16-QAM, SNR is increased 5.7 dB on BER at 10^{-3} as compared to 8-QAM and modulation techniques at a constant signal power.

CONCLUSION

WiMAX technology seems to have everything in one package. It can provide access to the Internet, television streaming, and wireless phone connection, all while incorporating mobility. While WiMAX is still a new technology, as it becomes more commonly used, the technology will become more widely available and the price will decrease. We developed a program in MATLAB, to study MIMO and MIMO-OFDM systems behaviour under different conditions. We have used the parameters data rate1Mbps, number of transmitted bits 100000, AWGN channel, 64 subcarriers OFDM signal, four types of modulation BPSK, QPSK, 16QAM and 64QAM.

REFRENCES

I. Mingji Ban and Sung Ho Cho (2009). An Efficient Communication Method between Processors in an Embedded Communication System, *International Conference on New Trends in Information and Service Science*, pp. 1268-1272.
II. Rehman Talukdar and Mridul Saikia (2014). Evolution and Innovation in 5G Cellular Communication System and Beyond: *A Study, arXiv*: **1407.4335v1 [cs.NI].**
III. Honey Garg, Namit Gupta and Chintan Patel (2013). Design of Wireless Sensor Node for Agriculture Field Monitoring, *International Journal of Electronics Communication and Computer Engineering, 4*(5).
IV. Mukesh Patidar, Rupesh dubey, Nitin kumar Jain and Sarita kulpariya (2012). Performance Analysis of WiMAX 802.16e Physical Layer Model, *IEEE, WOCN 2012, 978-1-4673-1989-8/12.*

V. Asvin Gohil, Hardik Modi and Shobhit K Patel (2013). 5G Technology of Mobile Communication: A Survey, ***International Conference on Intelligent Systems and Signal Processing (ISSP), IEEE.***

VI. Inhye Park, Hyungkeun Lee and Hyukjoon Lee (2013). Software Optimization for Embedded Communication System, ***IEEE, ICOIN 2013, 978-1-4673-5742-5/13.***

VII. Niraj Kumar Tiwari, Abhishek Kumar Pandey and Prashant Srivastava (2016). A Study on Next Generation Communication Technology: 5G, ***International Journal of Innovative Research in Computer and Communication Engineering, 4***(6).

VIII. Koffman I., Roman, V. (2002). Broadband wireless access solutions based on OFDM access in IEEE 802.16, ***Communications Magazine, IEEE, 40***(1), pp 96-103.

IX. Madan Lal (2011). BER Performance of Different Modulation Schemes for MIMO Systems, ***IJCSNS International Journal of Computer Science and Network Security, 11***(3).

X. Schanan Gupta, Mukesh Patidar and Pragya Nema (2015). Preamble Detection in WiMAX 802.16e on OFDM with AWGN Channel (2015). ***International Journal of Engineering Sciences & Management, 5***(2).

XI. Sebastian Eslava G., Carlos Sanchez, and y Catalina Muñoz Morales (2013). A System Level Hardware/Software Partition of a MIMO-OFDM System for Systemc Modeling, ***Revista de la Facultad de Ingeniería 14***(28).

XII. Ashish M Sitapara, Mukesh Patidar and Dr. Pragya Nema (2015). "Performance Analysis of WiMAX 802.16e using different Modulation scheme with MIMO System, ***International Journal of Engineering Sciences & Management, 5***(3).

XIII. Sanjay Verma and Namit Gupta (2012). Microcontroller-based Wireless Heart Rate Telemonitor for Home Care, ***IOSR Journal of Engineering (IOSRJEN), 2***(7), pp. 25-31.

XIV. Biswajit Sahoo, Ravi Ranjan Prasad (2015). BER Analysis of Mobile WiMAX System using LDPC Coding and MIMO System under Rayleigh Channel, ***International conference on Communication and Signal Processing***, April 5-5, 2015.

XV. Gede Puja Astawa (2013). Performance Analysis of MIMO-OFDM Using Convolution Codes with QAM Modulation, ***International Scholarly and Scientific Research & Innovation 7***(12).