Analysis of Different Fading Channels In MIMO System

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Abstract **- In this paper,MIMO model is used to increase the capacity of the radio link With the emergence of MIMO systems,multipath were effectively converted into a benefit for the communication system. MIMO indeed takes advantage of random fading, and possibly delay spread, to multiply transfer rates.in this analysis of various fading channels in MIMO system with its various extraordinary advantages.**

Index Terms **-. MIMO,Additive White Gaussian Noise Channel, Rayleigh , Rician Fading**

I. INTRODUCTION

Multiple-input and multiple-output, or **MIMO** is a method for multiplying the capacity of a radio link using multiple transmit and receive antennas to exploit multipath propagation. it has become an essential element of wireless communication standards including IEEE 802.11n, WiMAX (4G), and Long Term Evolution (4G). usually "MIMO" referred to the use of multiple antennas at the transmitter and the receiver. In modern usage, "MIMO" specifically refers to a practical technique for sending and receiving more than one data signal simultaneously over the same radio channel by exploiting multipath propagation. MIMO is fundamentally different from smart antenna techniques developed to enhance the performance of a single data signal, such as beamforming and diversity. Beamforming is a powerful technique which increases the link signal-to-noise ratio (SNR) through focusing the energy into desired directions. But the recent years have witnessed new proposals for using antenna arrays to increase the capacity of wireless links, creating enormous opportunities beyond just diversity. It turned out that diversity was only a first step to mitigate multipath propagation .With the emergence of MIMO systems, multipath were effectively converted into a benefit for the communication system. MIMO indeed takes advantage of random fading, and possibly delay spread, to multiply transfer rates.

II. ADVANTAGES OF MIMO

The core idea of MIMO is to use multiple antennas both for transmission and reception. This increases the capacity of the wireless channel. With this new technology comes in a lot of new advantages of MIMO which are discussed here in this section.

2.1 Array gain

Array gain is the average increase in the signal-to-noise ratio (SNR) at the receiver that arises from the coherent combining effect of multiple antennas at the receiver or transmitter or both[1].

2.2 Diversity gain

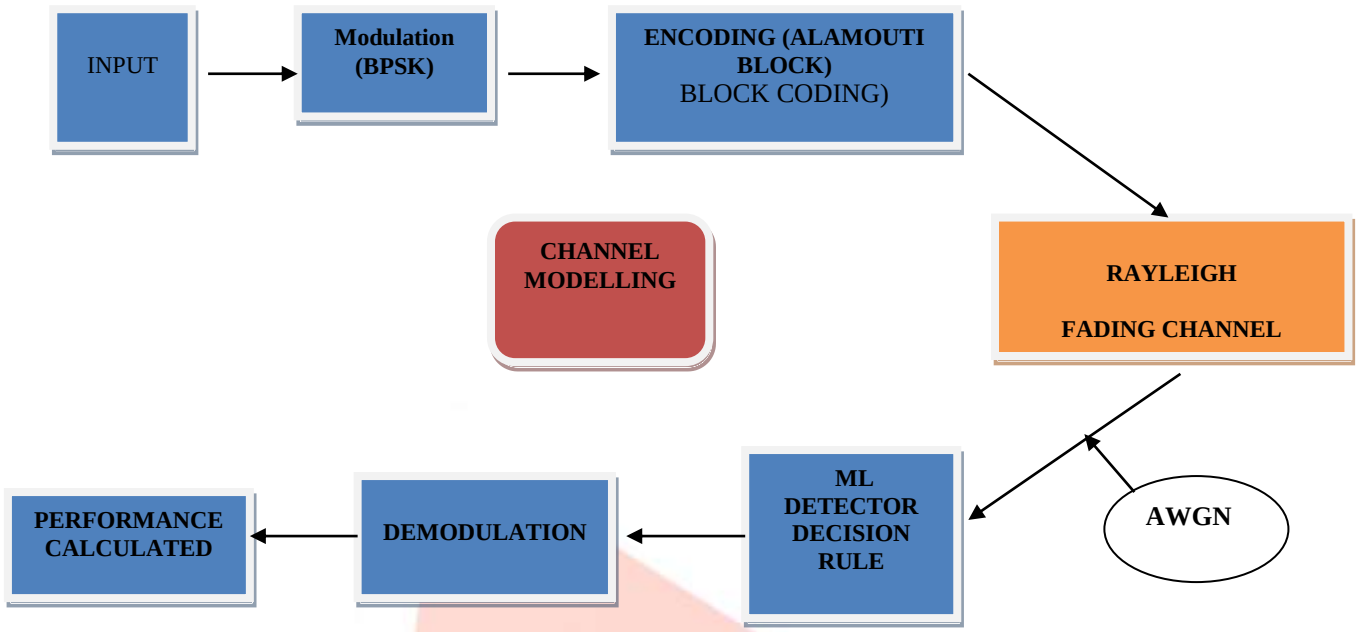
Multipath fading is a significant problem in communications. In a fading channel, signals experience fades (i.e., they fluctuate in their strength). When the signal power drops significantly, the channel is said to be in a fade. This gives rise to high bit error rates (BER). We resort to diversity to combat fading. This involves providing replicas of the transmitted signal over time,frequency, or space[1]. There are three types of diversity schemes in wireless communications, namely, temporal diversity, frequency diversity and spatial diversity. In the category of spatial diversity there are two more types of diversity that we need to consider. These are Polarization diversity and Angle diversity.

2.3 Spatial multiplexing

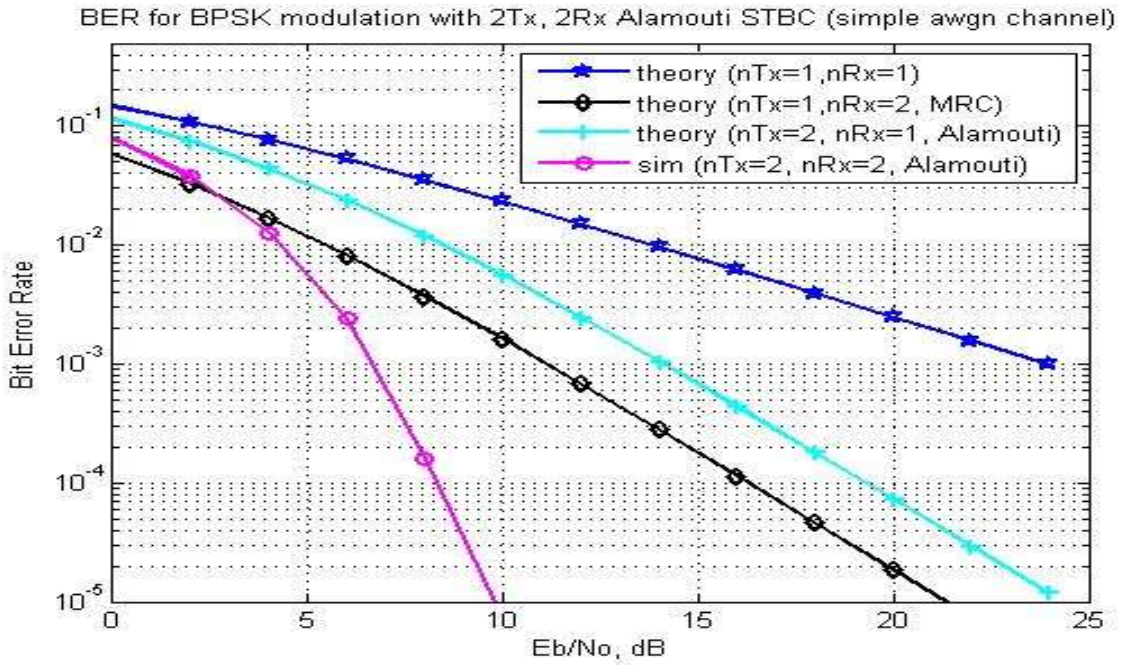
Spatial multiplexing offers a linear (in the number of transmit-receive antenna pairs or min (*MR* ,*MT*)) increase in the transmission rate (or capacity) for the same bandwidth and with no additional power expenditure. It is only possible in MIMO channels. The bit stream is split into two half-rate bit streams, modulated and transmitted simultaneously from both the antennas[1]. The receiver,having complete knowledge of the channel, recovers these individual bit streams and combines them so as to recover the original bit stream. Since the receiver has knowledge of the channel it provides receive diversity, but the system has no transmit diversity since the bit streams are completely different from each other in that they carry totally different data. Thus spatial multiplexing increases the transmission rates proportionally with the number of transmit13 receive

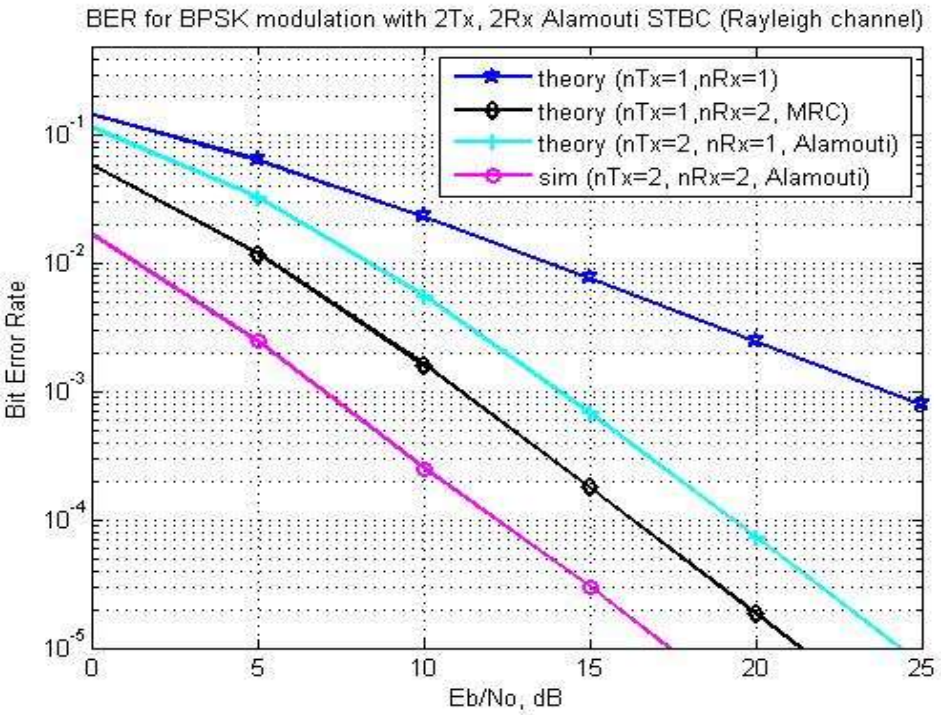
antenna pairs. The major problem of a MIMO system is that spatial multiplexing and diversity gain are both conflicting each other. Hence for different situations the most suitable combination of the two is selected.

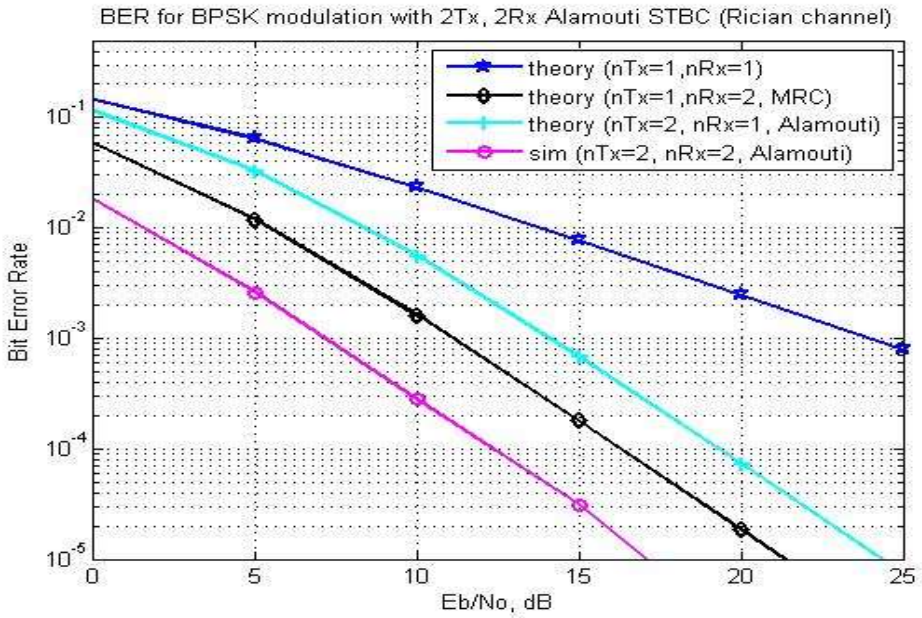
III. SIMULATION MODEL



IV. Simulation And Experimental Results







V. CONCLUSIONS AND RESULTS

A MATLAB code was written to simulate a MISO system in a simple Additive white Gaussian noise channel, a Rayleigh channel and a Rician channel.A transmit diversity scheme has been simulated in these models. The main stress of the modal is on the channel which is varied in every code. It is shown the plot of SNR against BER for two transmit antennas and one receive antenna and one transmit and two receive antennas for Rayleigh fading and Rician fading channels. An application of the scheme is to provide diversity improvement at all the remote units in a wireless system, using two transmit antennas at the base stations instead of two receive antennas at all the remote terminals. The scheme does not require any feedback from the receiver to the transmitter and its computation complexity is similar to MRRC..As the number of paths increases in the channel the simulated BER at a particular SNR gets closer to the expected BER at that SNR.

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