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PERFORMANCE IN QOSTBC WITH MIMO - OFDM SYSTEM ANALYSIS OF BER

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ABSTRACT - To achieve high data rates, speed and simultaneous increase in range and reliability without consuming extra radio frequency requires MIMO-OFDM for wireless broadband communication. This paper investigates the performance of MIMO-OFDM using QAM modulation schemes are used to encode and decode the data stream in wireless communication channel for transmitter and receiver. At the transmitter, a Quasi orthogonal space time block code (QOSTBC) is used to produce the coded information symbol with maximal data rate to be transmitted on each antenna. In this paper first we integrate OFDM to MIMO and calculate BER for performance analysis of the proposed system. This proposed work has been implemented in Mat lab R2013a.

KEYWORDS: OFDM, MIMO, BER and Mat lab.

I. INTRODUCTION

In The communication system information measure demand is become higher and better. So as to transmit knowledge with high speed, the wireless communication having a high spectral potency doesn't directly cause overcoming the weakening. Weakening could cause the reduction of spectral potency. It's terribly tough to match these requests for the standard modulation technique; however the MIMO-OFDM system combines the OFDM and MIMO technologies to fulfil these necessities. MIMO uses multiple antennas at a similar time within the transmitter and receiver, and it will increase the transmission rates by exploitation the random weakening and multi-path propagation. Key technology is space-time continuum & space-frequency signal process. The MIMO technology could be a terribly effective technique of sky rocketing the capability of the channel and system.

The receiver with multi-antenna will separate and decipher knowledge stream by exploitation advanced space-time continuum cryptography, and acquire the simplest process result. Specially, as a result of the amount of transmit antenna divides the most stream in sub-streams that are sent to the channel at a similar time or frequency and every transmitted signal

occupies a similar band, the information measure isn't enlarged. If the channels are freelance, the MIMO system is often seen as consisting of parallel area channels. It will increase data} rate by exploitation these channels to transmit information severally. OFDM uses 3 transmission principles, multirate, multisymbol, and multicarrier.

It additionally permits the information measure of subcarriers to overlap while not ICI as long because the modulated carriers are orthogonal. The adequate spacing provides the orthogonality of the subcarriers. This system prevents the detector from police work frequencies aside from the desired one. A MIMO-OFDM system with variety of subcarriers and variety of transmit antenna creates parallel transmission ways that are terribly the same as the one antenna OFDM system. The channel secret writing and also the digital modulation, which might even be done per branch, produce the modulated signals that are then space-time continuum coded exploitation the Alamouti algorithmic rule before transmittal from multiple antennas.

At the receiver, the Guard Interval is removed and N-point FFT is performed per receiver branch. Next, the transmitted image per TX antenna is combined and output for the following operations, like digital reception and cryptography. Finally all the input binary knowledge are recovered. This can be a decent technique to be used for next generation wireless systems. In MIMO system with completely different effort schemes Zero Forcing equalizer and MMSE that aid within the elimination of inhume image Interference (ISI) so up overall performance were compared to research the BER of the designed system. The MMSE equalizer clearly had an improved performance over the ZF equalizer within the region of concerning three sound unit. This helps in nullifying the results of ISI so up overall performance. This paper deals with a MATLAB simulation to research the performance of MIMO and OFDM technologies considering channel models with QAM modulation schemes. The paper shows that additional improvement of performance is often achieved through most versatile ASTC encoding scheme.

II. PROPOSED SYSTEM

Fig. 1 shows the MIMO communication system basic blocks. The information bits to be transmitted are encoded and interleaved. The spatial data streams are mapped to the transmit antennas by the space-time coding block with linear pre coding block thus spreading the various parallel streams across the various antennas with the aid of appropriate weighting factors. The receiver collects the signals at the output of each receive antenna element and reverses the transmitter operations in order to decode the data:

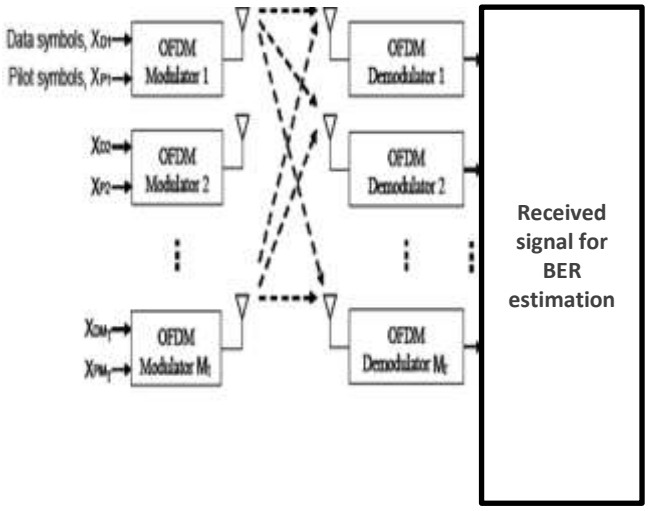

Figure 1 MIMO Transmit and Receive System Block Diagram

A MIMO-OFDM modulation technique can do reliable high rate transmission over broadband wireless channels. Orthogonal Frequency Division Multiplexing is one of the essential physical layer technologies for high data rate wireless communication due to its robustness and integrity to frequency selective fading, high spectral efficiency, and all type of computational complexity. OFDM will be used in Multiple-Input Multiple-Output transceiver to increase the diversity gain or the system capacity by undertaking spatial domain. Because the OFDM system effectively gives numerous parallel narrowband bandwidths, MIMO-OFDM is considered as a key technology in emerging high-data rate systems such as 4G, IEEE 802.16, and IEEE 802.11N.

MIMO communication uses multiple antennas at transmitter and as well as at receiver as shown in figure 1 to undertaking the spatial domain for spatial multiplexing or spatial diversity. In figure OFDM modulator and demodulator are from 1, 2, . ,M is specified each holds the entire OFDM system designed in [1], that has been used as multiple transmitter and multiple receiver respectively and Spatial multiplexing has been generally used to increase the capacity of a MIMO link by transmitting independent data streams in the same time slot and frequency band simultaneously from each transmit antenna, and differentiating multiple data streams at the receiver using channel information and address sent along with the data stream about each propagation path. In contrast to spatial multiplexing, the purpose of spatial diversity is to increase the diversity order of a MIMO link to mitigate fading by coding a signal across space and time so that a receiver could receive the replicas of the signal and combine those received signals constructively to achieve a diversity gain. AWGN Channel: Additive white Gaussian noise (AWGN) channel may be a basic or unremarkably used channel model for analysing modulation schemes. The AWGN channel adds a white Gaussian noise to the signal that passes through it. In our proposed system we were not implement AWGN channel for performance evaluation of QAM modulation technique. This paper deals with a MATLAB simulation to research the performance of MIMO and OFDM technologies considering channel models with QPSK modulation schemes.

III. MODULATION TECHNIQUE

The QAM modulator essentially follows the idea that can be seen from the basic QAM theory where there are two carrier signals with a phase shift of 90° between them. These are then amplitude modulated with the two data streams known as the I or In-phase and the Q or quadrature data streams. These are generated in the baseband processing area.

The two resultant signals are summed and then processed as required in the RF signal chain, typically converting them in frequency to the required final frequency and amplifying them as required. It is worth noting that as the amplitude of the signal varies any RF amplifiers must be linear to preserve the integrity of the signal. Any non-linearities will alter the relative levels of the signals and alter the phase difference, thereby distorting he signal and introducing the possibility of data errors.

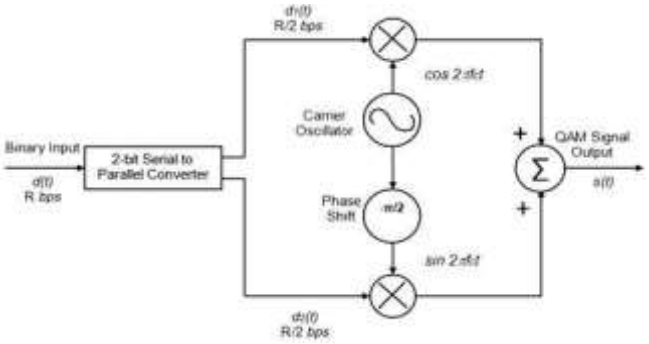

Figure 2 QAM Modulation

A. Bit Error Rate (BER)

In digital transmission, the no. of bit errors is the number of receiving bits of a signal data over a communication channel that has been changed because of noise, noise, distortion, interference or bit synchronization redundancy. This proposed system has less bit error rate. The bit error rate or bit error ratio (BER) is defined as the rate at which errors occur in a transmission system during a studied time interval. BER is a unit less quantity, often expressed as a percentage or 10 to the negative power. The definition of BER can be translated into a simple formula: BER = number of errors / total number of bits sent.

B. Signal to Noise Ratio (SNR):

It is the ratio of the received signal power over the noise power in the frequency range of the process. SNR is inversely related to BER, that is high BER causes low SNR. High BER causes an increase in packet loss, enhance in delay and decrease throughput. SNR is an indicator usually measures the clarity of the signal in a circuit or a wired/wireless transmission channel and measure in decibel (dB). The SNR is the ratio between the wanted signal and the unwanted background noise.

IV. EXPERIMENTAL RESULTS

The work presented in this system is aims to demonstrate OFDM communication with cyclic prefix has been implemented in MATLAB. Data are modulated and demodulated using QPSK.

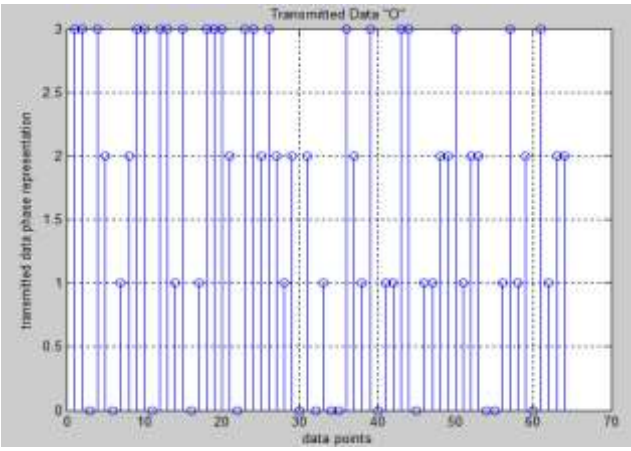

Figure 3 Data to be modulated by QAM

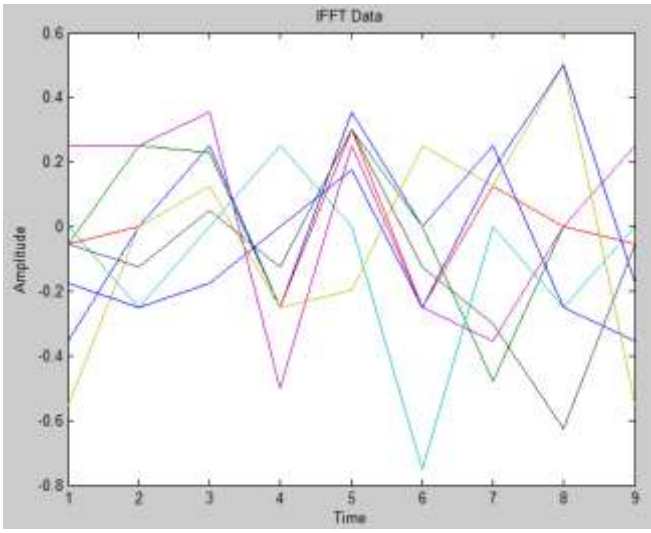

Figure 4 IFFT of input data

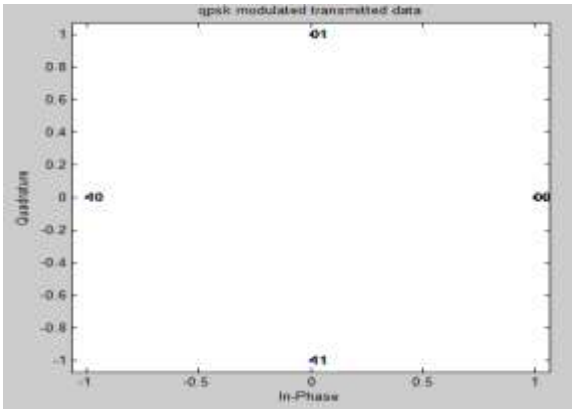

Figure 5 Transmitted signal with QAM Modulation

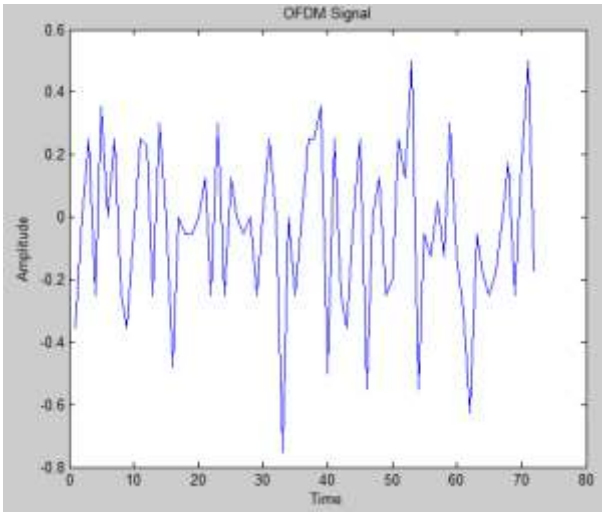

Figure 6 OFDM signal

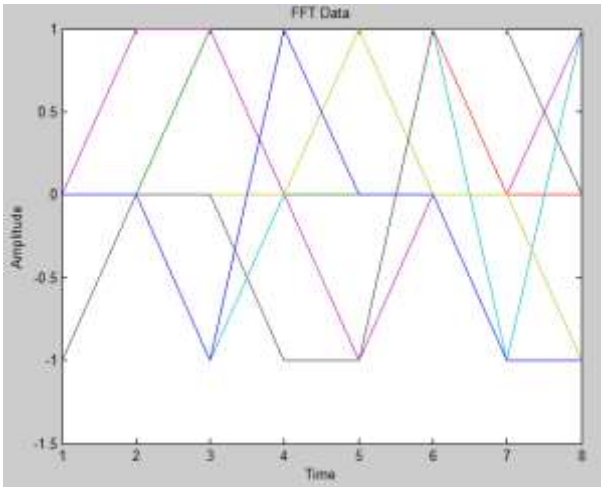

Figure 7 FFT of the transmitted signal

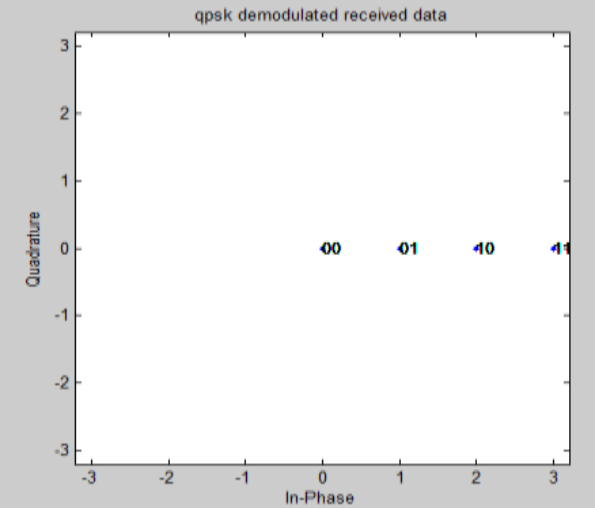

Figure 8 Received signal with QAM Demodulation

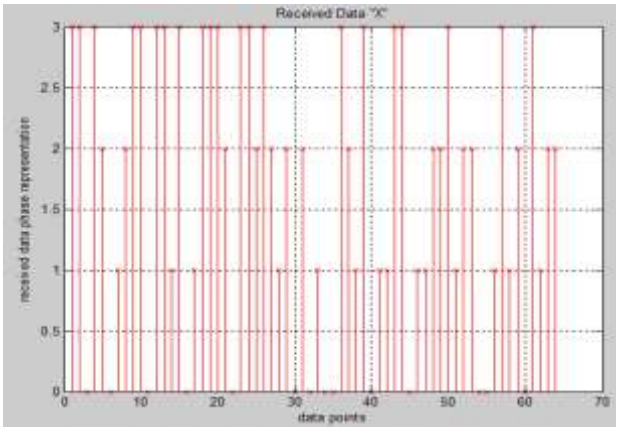

Figure 9 Received Data without noise

V. CONCLUSIONS

The importance of multi-carrier communication system has been established in the present communication era. The merits and demerits of OFDM system along with its implication are discussed in first chapter. Multi-carrier communication system especially OFDM has been evolved as one of such potential candidate which are bandwidth efficient and robust to multipath channel condition (frequency selective fading). The research activities in OFDM have grown tremendously during last two decades. Due to its advantageous features like high spectral efficiency, easy equalization and robustness to frequency selective fading channel, the OFDM has been adopted by many broadband wireless communication standards like DAB, DVB-T, IEEE 802.11, 802.16 and UWB communication systems.

VI. FUTURE WORK

Multiple Input and Multiple Output (MIMO) systems when combined with OFDM significantly increase the throughput in fading wireless channels. The synchronization algorithms 129 for MIMO OFDM system need consider the interference from other antennas and hence need to be investigated. Orthogonal Frequency Division Multiple Access (OFDMA) is the technology to support multi user OFDM wireless communications. The synchronization algorithms for OFDMA need to consider the multiuser interference and hence need to be investigated. Cognitive Radio (CR) systems have gained predominant research interest from both academia and industry due to its spectral advantage. Synchronization algorithms for OFDM based CR systems need to consider the interference scenario due to the primary and secondary users and hence need to be investigated.

Wireless Relay Networks (WRN) are gaining increased attention from researchers due to its extended coverage and reliable communication. Wireless relay networks with OFDM systems are also being probed. Synchronization algorithms for OFDM based relay networks need to consider the effect of combined channel between source to relay and relay to destination and hence need to be investigated.

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