



## INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

### IMPROVING STBC MIMO-OFDM SYSTEMS WITH PAPR FOR DIFFERENT MODULATION TECHNIQUES

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#### ABSTRACT

Orthogonal frequency division multiplexing (OFDM) has become a prevalent and widespread technique for the broadcast and transmission of signals over wireless channels. Multiple-Input Multiple-Output Orthogonal Frequency Division Multiplexing (MIMO-OFDM) is a promising Modulation scheme for high Performance Broadband wireless Communication that suffer from major Drawback, which is the high Peak-to-Average Power Ratio (PAPR) of the output signals. In this Paper a new blind combined Alamouti Space-Time Block-Codes (STBC) approach inspired from Selected Mapping (SLM) Process to solve this PAPR issue for MIMO-OFDM Systems

**KEYWORDS:** OFDM, PAPR, STBC, SLM.

#### INTRODUCTION

The Orthogonal Frequency Division Multiplexing (OFDM) modulation technique is a multi-carrier transmission scheme that is used in many current wireless standards and systems due to its robustness to channel fading, high spectral efficiency, immunity to Inter-Symbol Interference (ISI), . . . [1], [2]. This is why the OFDM scheme represents a good solution for high speed digital communications (DVB-T, DAB-T, IEEE 802.16d, . . .) [3]. The combination of the OFDM scheme with MIMO based transmission allows a significant improve of the spectrum efficiency and the achievement of high data rates for wireless systems. However, in MIMO-OFDM systems, the transmitted signal presents large envelope fluctuations, which exhibits a very high PAPR level due to OFDM characteristics [5]. This aspect can considerably reduce the average power at the output of the High-Power Amplifier (HPA) that is used at the transmitter To avoid the large back-off and expensive amplifier solutions, many techniques were proposed [14]. Among these solutions, the first and the simplest one is the clipping of the signal to amplify [6], methods including coding techniques [7], schemes that uses the existing relationship between specific coding properties and the OFDM modulator [8], Selected Mapping (SLM) [9], Partial Transmit Sequence (PTS) [10], Tone Reservation (TR) [11], . . . degradation. The PAPR reduction is realized by multiplying independent indexed phase sequences by the original data and then selecting the resulted SLM signal that achieves a good PAPR reduction whose index constitutes a Side Information (SI). Inspired from this technique and in order to reduce the PAPR in MIMO-OFDM systems, we propose a novel blind method that omits the need to send an SI. To do so, we conceive at the receiver side, an adequate set of rotated and unrotated constellation and a precoders codebook containing different configurations of two specific Alamouti Space-Time Block Codes (STBC) patterns. PAPR is defined as the ratio of Peak Power to Average power of time domain complex baseband signal which is to be transmitted. PAPR Reduction Techniques are clipping, Peak windowing, Scrambling, Block Coding, Selected Mapping (SLM) and Partial transmit Sequences (PTS). Clipping: The simple method is to clip the transmitted signal which is modelled as multiplication or convolution of signal having high PAPR with window function. Undesired widening of the signal due to clipping is limited using filter technique various window function such as cosine, Kaiser and Hamming are available. Pros of it is simple and its cons is cause interference or distortion or outband emission which degrades the system performance. Selected Mapping (SLM): The concept here is any one single data vector of the transmitted signal can have multiple representations. Out of these lowest PAPR time domain vector is selected for transmission. Its pros is lowest PAPR and cons is complexity issue as SLM Scheme need multiple IFFT operation. Peak windowing: here large signal peak of the signal is multiplied with Gaussian shaped window. Suitable window function is selected for multiplication from

cosines, Kaiser and Hamming windows. Its pros is simple and cons is both BER and out of Band radiation is increased. Scrambling : This technique utilize the scrambling techniques to polarities of the subcarrier which removes correlation among the subcarrier irrespective of user codes used. PAPR will be greatly reduced as it will spread the information over larger band. Block Coding: Find out the codeword with minimum PAPR from a given set of codewords map the input data blocks to these selected codewords. Map the input data blocks to these selected codewords. Partial Transmit Sequence: This method is similar to SLM. but divide the frequency vector into smaller block before applying the phase transformations. Its pros is lowest PAPR and little redundancy and cons is increased system complexity.

### EXPERIMENTAL STEPS FOR PERFORMANCE EVALUATION

The following algorithm steps are followed completely in the paper

Step 1: The program is started and then the input bits are generated randomly

Step 2: The input signals are modulated using BPSK modulation.

Step 3: Then it is space time block encoded and after that the serial data is converted into parallel data. The Differential Space time codes are ways of transmitting data in wireless communications.

Step 4: The mapped sequences are computed using Inverse Fast Fourier Transforms

Step 5: The guard time interval is added and then the parallel data is converted into serial data.

Step 6: The attenuation is calculated and it is passed through the Rayleigh Multipath Channel

Step 7: Then it is obtained at the receiver and the serial data is converted into parallel data

Step 8: The Guard interval is removed and then the Fast Fourier Transform is applied to the time domain .

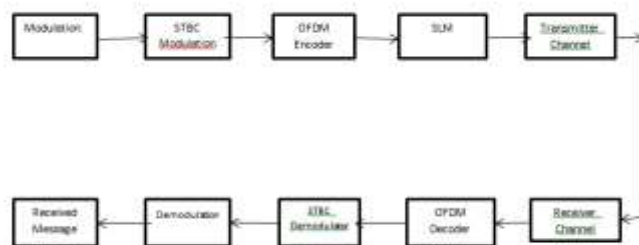
Step 9: Once again the Parallel data is converted into serial data and then it is passed into the Space Time Block Decoder.

Step 10 A Performance Comparison is drawn between the Bit Error Rate obtained for (2 x 1) and (2 x 2) DSTBC MIMO-OFDM systems under BPSK Modulation Technique.

Step 11: Stop the program

### SYSTEM MODEL

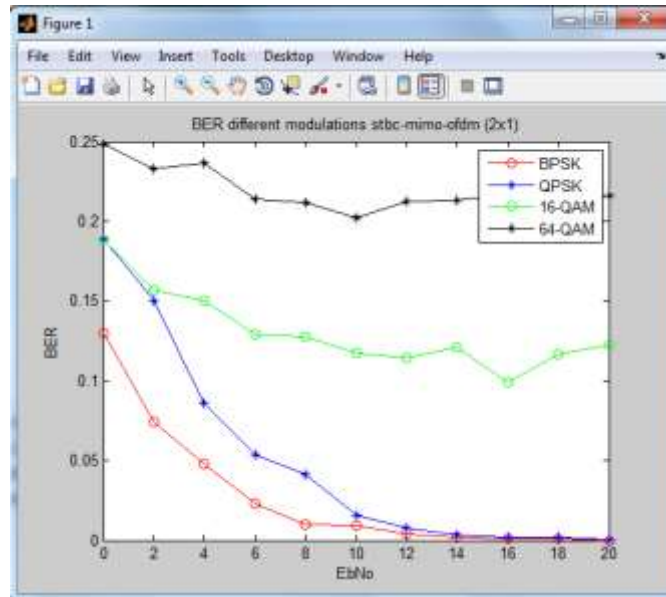
Basic Alamouti STBC-OFDM system The most well-known transmit diversity technique was introduced by Alamouti [12] where the proposed orthogonal code ensures full diversity As shown in [13], the Alamouti precoding can be implemented either as a STBC . In order to simplify the descriptions of our proposed method, we consider a STBC System with two transmit and one receive antennas. For other systems with more transmit antennas, our proposed method can be easily extended.



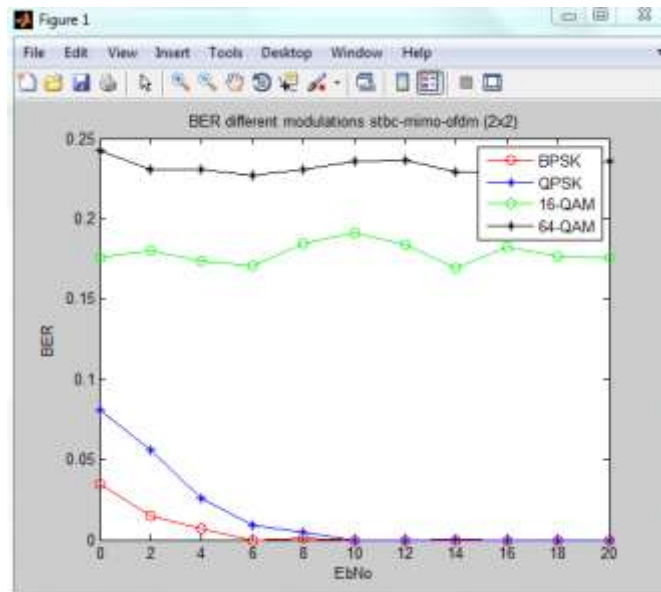
A general communication system using space-time block coding with two transmit antennas and two receive antennas. At the transmitter side the information blocks of symbols are passed to the space-time block encoder, where each block contain two symbols.

**PERFORMANCE ANALYSIS OF DSTBC MIMO-OFDM SYSTEMS UNDER DIFFERENT MODULATION SCHEMES**

On the careful analysis it is understood that for a 2 x 1 DSTBC-MIMO-OFDM system, if BPSK modulation is applied then it produces a very low bit error rate when compared to that of the other modulation schemes.



*Fig.1. Performance Analysis of DSTBC MIMO OFDM System under different Modulation Scheme(2 X 1)*

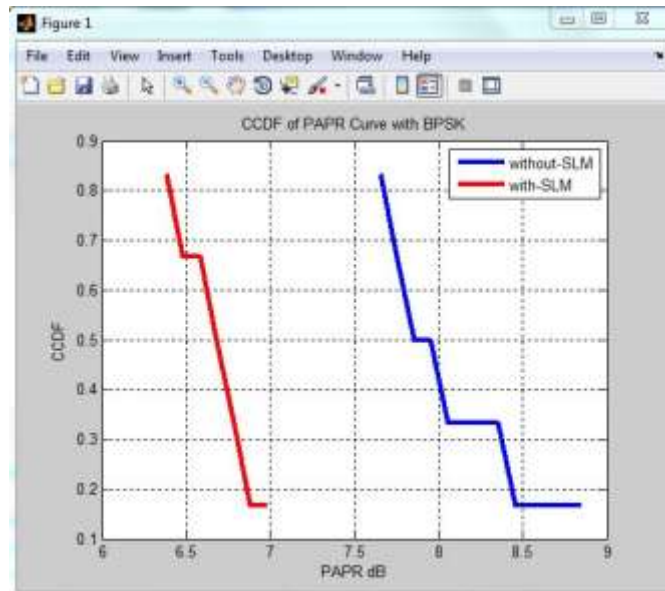


*Fig.2. Performance Analysis of DSTBC MIMO OFDM Systems under Different Modulation Scheme (2 x 2)*

On the careful analysis it is understood that for a 2 x 2 DSTBC MIMO-OFDM system, if BPSK modulation is applied then it produces a very low bit error rate when compared to that of the other modulation schemes. The overall BER produced in the 2 x 2 systems is comparatively less when compared to that of the 2 x 1 systems.

## PAPR REDUCTION

The SLM represents a powerful PAPR reduction Technique in OFDM systems .In the Transmitter side add the SLM , Performing our purposed algorithm leads to a considerable PAPR reduction compared to the basic Alamouti STBC-OFDM System .



## CONCLUSION

This paper gives a short introduction to STBC MIMO– OFDM Systems followed by a short survey on the different Modulation Technique. From the different Modulation Technique BPSK Technique is best Because of its low bit Error rate. Further the performance analysis of Rayleigh fading channels in Differential Space Time Block Coded MIMO-OFDM systems are analysed for two transmit antennas and one or more antennas under BPSK modulation scheme and the performance is evaluated based on the Signal to the Noise Ratio versus Bit Error Rate. By using SLM ,PAPR reduced.

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