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Review of PAPR Reduction in Wireless System with PTS Method

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Abstract: ***In wireless communication, the receiver side BER strongly affected by channels noise, interference, distortion, synchronization error and wireless multipath fading channels. For better transmission system single carrier waves are being replaced by multi carrier waves techniques as MIMO OFDM is implemented now days. The peak power of a multi carrier OFDM signal is a critical design factor for band limited communication systems, and it is necessary to reduce it as much as possible. An Interleaving, Selected Mapping, Partial Transmit Sequences and Tone Reservation are PAPR reduction techniques, but in these paper partial transmit sequence technique has been reviewed.***

Keyword: MIMO, OFDM, PAPR, LDPC, PTS, QAM, QPSK, etc

1. Introduction

Wireless communications is an emerging field. It has grown at a tremendous rate in the last ten to twenty years. It is having lot of ideas for increasing capacity and BER performance. All emerged based on wireless technology to provide higher throughput, immense mobility, longer range, robust backbone to thereat. The number of telecommunications innovations grew rapidly during the last half of the 20th century. Currently there is widespread and growing use of cellular phones, cordless phones, digital satellite systems, and personal mobile radio networks. Wireless communications occurs at many different frequencies, from underwater communication at extremely low frequencies .There are various technology comes in the picture to improve the performance of the wireless communication like single carrier communication and multicarrier communication [1].

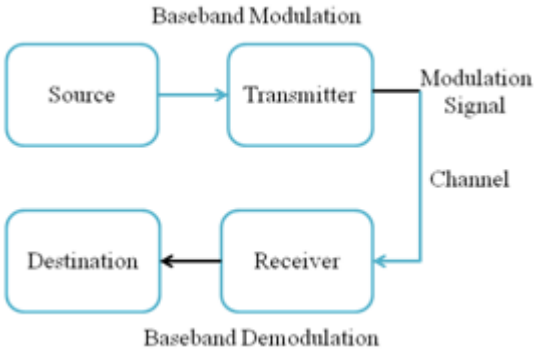

Figure 1: Wireless communication system

Recently many standards proposals, namely TGnSync, or WWise for IEEE 802.11n, together with IEEE 802.16e, have considered LDPC coding schemes as key component of their system features. The adoption by such standards activities proves the increasing maturity of the LDPC related technology, especially the affordable joint complexity from encoder and decoder implementation. From sub-optimal lower-complexity decoding algorithms to complete flexible architecture design, some pragmatic and realistic implementation solutions allow LDPC codes to be more and more attractive as enhancement of current (B3G) or next generation wireless systems (4G).

OFDM is one of the many multicarrier modulation schemes, which provides high spectral efficiency, low implementation complexity, less susceptibility to echoes and non linear distortion. Owing to these advantages of the OFDM system, it is greatly used in various communication systems. But the main problem one faces for implementing this system is the high peak to average power ratio of this system. A large PAPR increases the difficulty of the analog to digital and digital to analog converter and reduces the efficiency of the radio frequency (RF) power amplifier [3]. Regulatory and application constraints can be implemented to reduce the peak transmitted power which in turn reduces the range of multi carrier transmission. This lead to the hindrance of spectral growth and the transmitter power amplifier is no longer confined to linear region in which it must operate. This has a injurious effect on the battery lifetime. Therefore in communication system, it has been observed that all the potential benefits of multi carrier transmission can be out - weighed by a high PAPR value [3]. There are a number of techniques to deal with the problem of PAPR. Some of them are amplitude clipping, clipping and filtering, partial transmit sequence (PTS) and „interleaving". These techniques achieve PAPR reduction at the expense of transmit signal power increase, bit error rate (BER) increase with data rate loss and computational complexity increase.

The conventional solution to the PAPR problem is to use a linear amplifier or to backoff the operating point of a nonlinear amplifier but both approaches resulting in a significant power efficiency penalty [4]. Many alternative solutions have been proposed. The simplest is deliberately clipping the OFDM signal before amplification, which gives a good PAPR but suffers some performance degradation. Another uses non linear block coding, where the desired data sequence is embedded in a larger sequence and only a subset of all the possible sequence are needed, those with low peak powers. Using this approach a better PAPR can be achieved with only a small bandwidth penalty. However,

large look up table are required to implement this coding scheme, limiting its usefulness to applications with a small number of subcarriers. PAPR can be reduced by increasing average power using Tone Injection (TI), Tone Reservation (TR) and Active Constellation Extention (ACE). Signal scrambling techniques such as Partial Transmit Sequence (PTS) and Selective Level Mapping (SLM) reduce PAPR significantly without loss of information. In this paper, PTS is considered for reduction of PAPR.

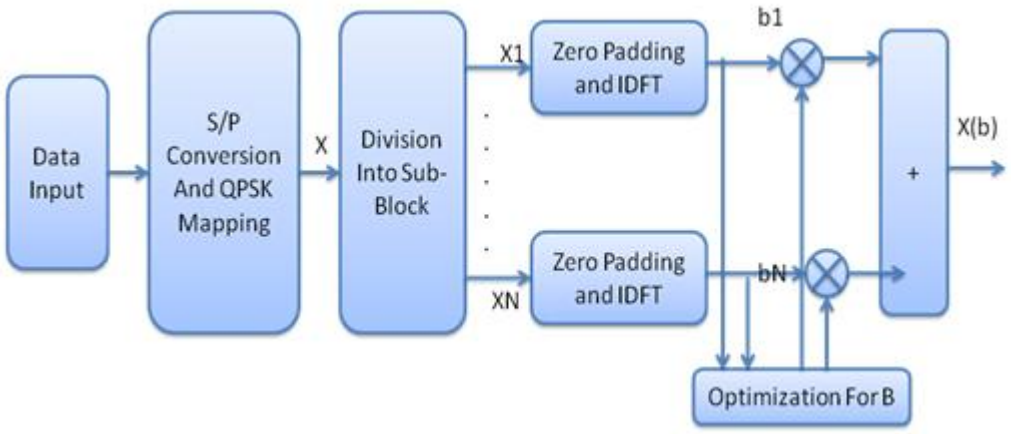

Figure 2: Block diagram PTS

2. Literature Review

The many researchers have been done in field of economic dispatch problem some of the work is described in this paper.

Srinu Pyla, et.al, "PAPR reduction in ofdm systems using pts and various modulation schemes", done study in this paper, in a very high speed communication systems are required. The orthogonal Frequency Division Multiplexing (OFDM) is a suitable technique for achieving high data rate transmission but the main drawback of OFDM is increase in peak power termed as high peak to average power ratio. This high PAPR leads to an in-band distortion due to clipping and out of band radiation due to spectral broadening in power limited devices especially in wireless applications. In this paper, Partial Transmit Sequence (PTS) technique is considered as it is a distortion less one and reduces peak power significantly. In the improvement of PAPR with order of digital modulation schemes is investigated and minimum PAPR phase factors are identified. Data is encoded using Low Density Parity Check (LDPC) code as the performance of this code is nearest to the shannon's channel capacity and the results are simulated using MATLAB system. From the results, it is concluded that PTS affectively reduces PAPR to a considerable extent and PAPR improvement increases with the order of the modulation techniques. For the same order of PSK and QAM modulation, the improvement is almost same but probability of error for QAM is less compare to PSK for the same order of modulation. The difference of the requirement of threshold power (PAPR0) is very small (within 1dB) for N=64,128 and 256. Hence more number of candidates can be accommodated with less amount of power. The proposed technique can be used in wireless applications [1].

Gamal Mabrouk Abdel, "Performance Improvement of MIMO-OFDM Wireless Systems using PAPR Reduction Techniques", in this paper, in High Peak to Average Power Ratio (PAPR) for MIMO-OFDM system is still a demanding area and difficult issue. The radio transmitter stations for covering and getting enough transmitted power in their desired area has to use High Power Amplifier. On the other hand, in order the HPA to have the most output power efficiency must be designed to work close to the saturation region, therefore due to the high PAPR of input signals, a factor which is called memory-less nonlinear distortion will affect the communication channels. For reducing PAPR, numerous techniques have been recommended. This paper the performance and the efficiency of two types of them will be discussed and simulated and then we will propose our suggested method for a conventional OFDM. No words can ever express our thanks to every person who contributed to the fulfillment of this work. It have been honored to work under the supervision of Assoc. would like to extend our deepest thanks and appreciation to them for the supervision, inspiration, useful assistance, constructive discussion and guidance throughout the course of this work [2].

R. Divya Kanti, "Systematic Comparison of Different PAPR Reduction Methods in OFDM Systems", done study in this paper, the selected mapping (SLM) is a well-known technique for peak to-average power ratio (PAPR) reduction of orthogonal frequency-division multiplexing (OFDM) systems. In this paper, an SLM technique is introduced for the PAPR reduction of space-frequency-block-coded OFDM systems with Alamouti coding scheme. In this paper, we also propose a simple technique for the reduction of high Peak to Average Power Ratio (PAPR), based on Clipping and Differential Scaling, in Orthogonal Frequency Division Multiplexing (OFDM) systems. The amplitude of complex OFDM signal is clipped and then scaled in such a way so that the PAPR is reduced without causing much degradation in bit error rate (BER). In a determined the threshold values for clipping and scaling using Monte Carlo Simulations. It is used clipping along with three different scaling methods, namely up scaling, down scaling and up-down scaling. Simulations, obtained the values of threshold for clipping and parameters for scaling with a view to reduce PAPR without degradation in BER. These have presented the

PAPR and BER performance for all the techniques considered. The proposed up down scaling technique is able to achieve PAPR reduction of the order of 8.5 dB from 12 dB PAPR initially. The proposed technique is able to achieve a PAPR of 3.5 dB while maintaining the BER within a margin of 3 times the BER value at the performance bound at an SNR of 10 dB [3].

Md. Ibrahim Abdullah, in this paper, the orthogonal frequency division multiplexing (OFDM) is considered to be a promising technique against the multipath fading channel for wireless communications. OFDM faces the Peak-to-Average Power Ratio (PAPR) problem that is a major drawback of multicarrier transmission system which leads to power inefficiency in RF section of the transmitter. In this paper present different PAPR reduction techniques and conclude an overall comparison of these techniques. They also simulate the selected mapping technique (SLM) for different route number which is most efficient technique for PAPR reduction when the number of subcarrier is large. SLM algorithm adapted to any length of route number that means it can be used for different OFDM systems with different number of carriers. It is particularly suitable for the OFDM system with a large number of sub-carriers. This research will continue in directions Firstly, an PAPR reduction concepts will be expanded for distortion less transmission and identifying the best alternatives in terms of performance increase Secondly, the PAPR reduction technique will be develop for low data rate loss and efficient use of channel. The complexity issues of the PAPR reduction technique is required, especially looking at ways of further reducing the complexity of the sphere decoder [4].

A. Bensaad, "PAPR Reduction in MIMO-OFDM Systems Using PTS Method", they have done study this paper, the Multiple-Input Multiple-Output Orthogonal Frequency Division Multiplexing (MIMO-OFDM) is an attractive method which has gained significant interests as a promising candidate for the 4th Generation wireless communication. One of the main disadvantages of MIMO-OFDM is its high peak to average power ratio. In this paper, Partial Transmit Sequences (PTS) method introduced in the MIMO-OFDM system is presented with various simulation results to verify its effectiveness. The PAPR performance becomes better. The Pseudo-random seems leading the better performance. Thus, a high dynamic range amplifier is needed, in which increases the cost of the system and reduces the power efficiency. In this paper, PAPR reduction in MIMO-OFDM systems using PTS method is investigated. The PTS technique improves the performance of the MIMO-OFDM. It should be noted that the data can be divided into a number of non overlapping sub-blocks in different structures. In PTS sub-block with pseudo random having the best performance and interleaving having the worst [5].

3. Conclusion and Results

The various papers and literature has been studied for MIMO-OFDM & PAPR reduction technique. MIMO-OFDM system with PTS technique is seems to approach to reduce peak average power ratio (PAPR) in OFDM based wireless communication system. The result shows that this technique provides better PAPR & BER performance then other PAPR reduction technique. The MIMO technique with PTS PAPR reduction technique can be perform further better with optimization of communication parameter & may be a future technique for OFDM based system. This survey gives an opportunity to explore the area of research for betterment of OFDM based system.

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