International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

Papr and Picr Reduction of Ofdm Signals with Slm-Pts And Eak Cancellation

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ABSTRACT

Orthogonal frequency division multiplexing (OFDM) suffers from a high peak-to-average power ratio (PAPR). Tone injection (TI) extends the original constellation to several equivalent points so that these extra freedom degrees can be exploited for the PAPR reduction. However, optimal TI requires an exhaustive search over all possible constellations, which is a hard discrete optimization problem. To address this problem, a novel TI scheme that uses the clipping noise to find the optimal equivalent outer ring extended constellations and hexagonal constellations is proposed. By minimizing the mean rounding error of the clipping noise and possible equivalent constellations, the proposed scheme can easily determine the size and position of the optimal equivalent constellations. Secondly, a new TI scheme is also introduced in order to reduce the nonlinear distortion in the presence of power amplifier. This scheme takes the root-mean-square peak interference-to-carrier ratio (PICR) reduction as the target to obtain a better bit error rate (BER) performance. Simulation results show that to achieve a considerable system performance, the proposed TI schemes only need eighteen fast Fourier transforms (FFTs), while other TI and partial transmit sequence (PTS) schemes need hundreds of FFTs.

IndexTerms—Orthogonal frequency division multiplexing peak-to-average power ratio, tone injection (TI), peak interference-to-carrier ratio, power amplifier.

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1. INTRODUCTION

Due to the advantages of high spectral efficiency and easy operation with FFT and durability to selective fading of frequency [1], multi-carrier modulation, particularly orthogonal frequency division (OFDM), has attracted explosive attention at a number of high velocity, however , The high peak-to-medium capacity (BAPR) [2] of the sent-to-transmit signals requires a power amplifier with a very high dynamic range, greatly reducing the speaker's efficiency. Therefore, personal use of this material is permitted. However, permission must be used to use these materials for any other purposes. Different papar reduction techniques have been proposed, which can be divided into two groups. One group processes direct-served signals, such as chopping and filtering [4] - [6], conversion conversion [7] - [9]. In this group, the signal is wet and filtered or deliberately fed to a predetermined level, and the bit error rate (BAPR) is reduced at the expense of in-band deformation (eg increased bit error rate and out-of-band radiation.) 5 Moreover, The filtration process may lead to peak re-growth, leading to an increase in PAPER The other group intends to reduce the occurrence of large signals prior to multi-carrier formation, including the possibility of preserving the tone of nonpigjective towers and encoding techniques. However, the complexity of probabilistic techniques Multiplied by the number of sub-barriers Side data in the future to decode the symbols of income. And will lead the side information received incorrectly to errors occur in bursts. See also it requires many iterations weighing enough limit Babur [14], which involves computational complexity is high. The constellation Nonpejective [17] plots the data symbol into one of many constellation points. By properly selecting the right cluster points between the set of permissible points, the BABR ratio can be reduced significantly without loss of data rate or additional side information. One of the most effective methods of this type is the injection of tone (T) [17] - [24], which uses a periodic extension of the towers to provide an alternative encoding with a lower bumper. However, the implementation of T-technology requires solving an integer problem that is difficult, which grows exponentially with a number of sub-carriers. Therefore, optimal T solutions are sought [18] - [24].

2 OFDM SYSTEM The general block diagram of OFDM system is shown below in fig.1.

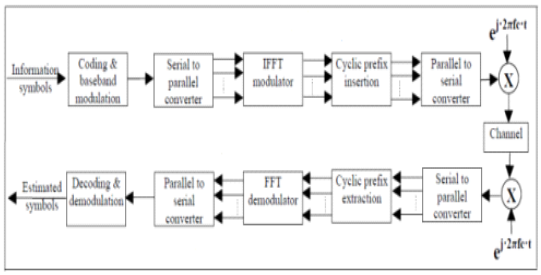


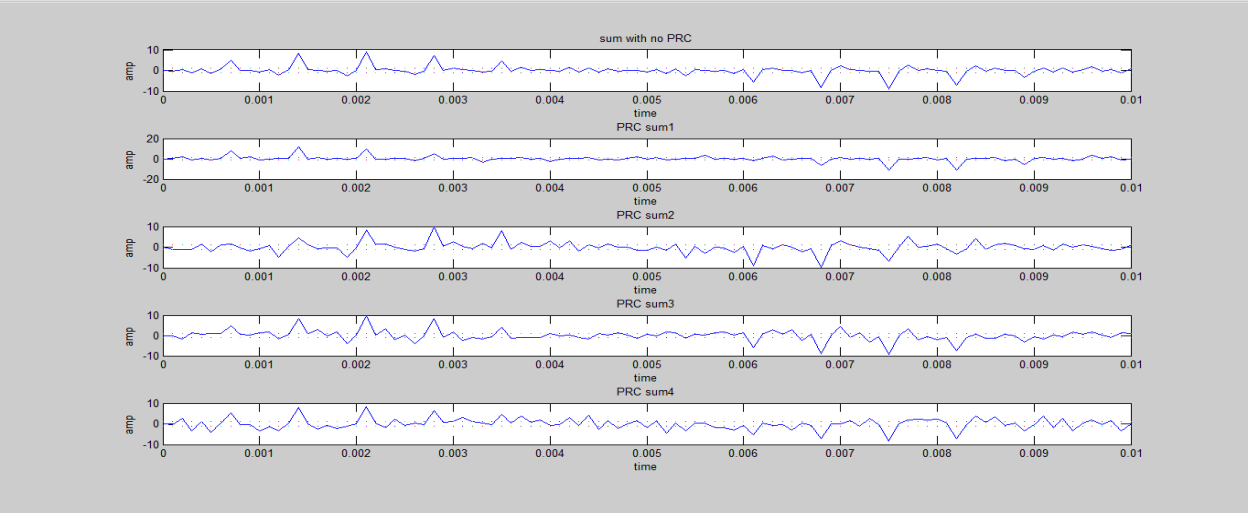
Fig.1: OFDM System

The input data sequence is first modulated by using any modulation technique among the different modulation type. Different modulation schemes such as BPSK, QPSK, QAM can be used. The data symbols are converted into parallel form in N different sub-streams and each sub-stream is modulated with a separate subcarrier. Then all these modulated subcarriers are passed through IFFFT block. IFFT is the main component of OFDM system. Inter-symbol and interchannel interference can be eliminated by adding cyclic prefix. The cyclic prefix is obtained by copying the last samples of symbols in front of it. Thus cyclic prefix is a circular extension cyclic of IFFT modulated symbols. Cyclic prefix is added after IFFT modulation. OFDM symbol are further converted back into serial form and transmitted through the channel to the receiver. At receiver end all above operation are performed inversely. Received OFDM signal is converted into parallel form and cyclic prefix is removed. Then demodulation is performed to extract the transmitted symbols. After performing FFT data is converted into serial form and demodulate using appropriate modulation scheme that has been used at transmitter to extract the original transmitted data sequence. Generally data symbols are modulated by using phase shift keying (PSK) modulation or quadrature amplitude modulation (QAM) and then transmitted using N different subcarriers in typical OFDM system. Let the input data block is represented using vector X = [X0, X1, · · · , XN−1] T where N denotes the number of subcarriers in OFDM. Then the OFDM signal consisting of N subcarriers is given by [4] In above equation j =√−1, NT is data block period and Δf denotes subcarrier spacing. The peak value of OFDM signal can be very large due to presence of large number of separately modulated subcarriers as compared to average of complete system. The peak to average power ratio (PAPR) is defined as the ratio of peak value to the average power value of OFDM system. Thus PAPR of transmitted signal is given by [4]

3. MECHANISM

The purpose of Tone Injection Technique is to increase constellation size by mapping the points from original constellation into various equivalent points in the expanded constellation. And this is responsible for PAPR reduction. It allows data tones and peak reduction tones to be overlapped. As this technique is similar to multicarrier signal where tones of equal frequency with phase are injected. Hence this technique is called as Tone Injection (TI). Specifically, by merging the data signal with PAPR reduction signal we can produce the signal which is to be transmitted in time domain with decrease PAPR. [7] Where these terms show the frequency domain and the relative time domain respectively. As in frequency domain the data tones and peak reduction tones(PRTs) are not separated orthogonally. So at receiver we have to eliminate the effect of C[k]. In this method, we can construct signal with reduced PAPR as C[k]=p[k].D + jq[k].D where to minimize the PAPR p[k] and q[k] are selected. Here D is a constant selected as a positive real number. We can discard C[k] at the receiver by applying modulo-D operation on the real and imaginary parts at the output of the frequency-domain equalizer[FEQ]. This can be shown as [7] Fig.2 :Expanded constellation of 16-QAM for TI Method[7] Above fig2. shows expanded constellation diagram of 16-QAM used in TI technique. Here, original QAM and expanded QAM symbols are denoted by the black and white points respectively.

4.RESULTS:



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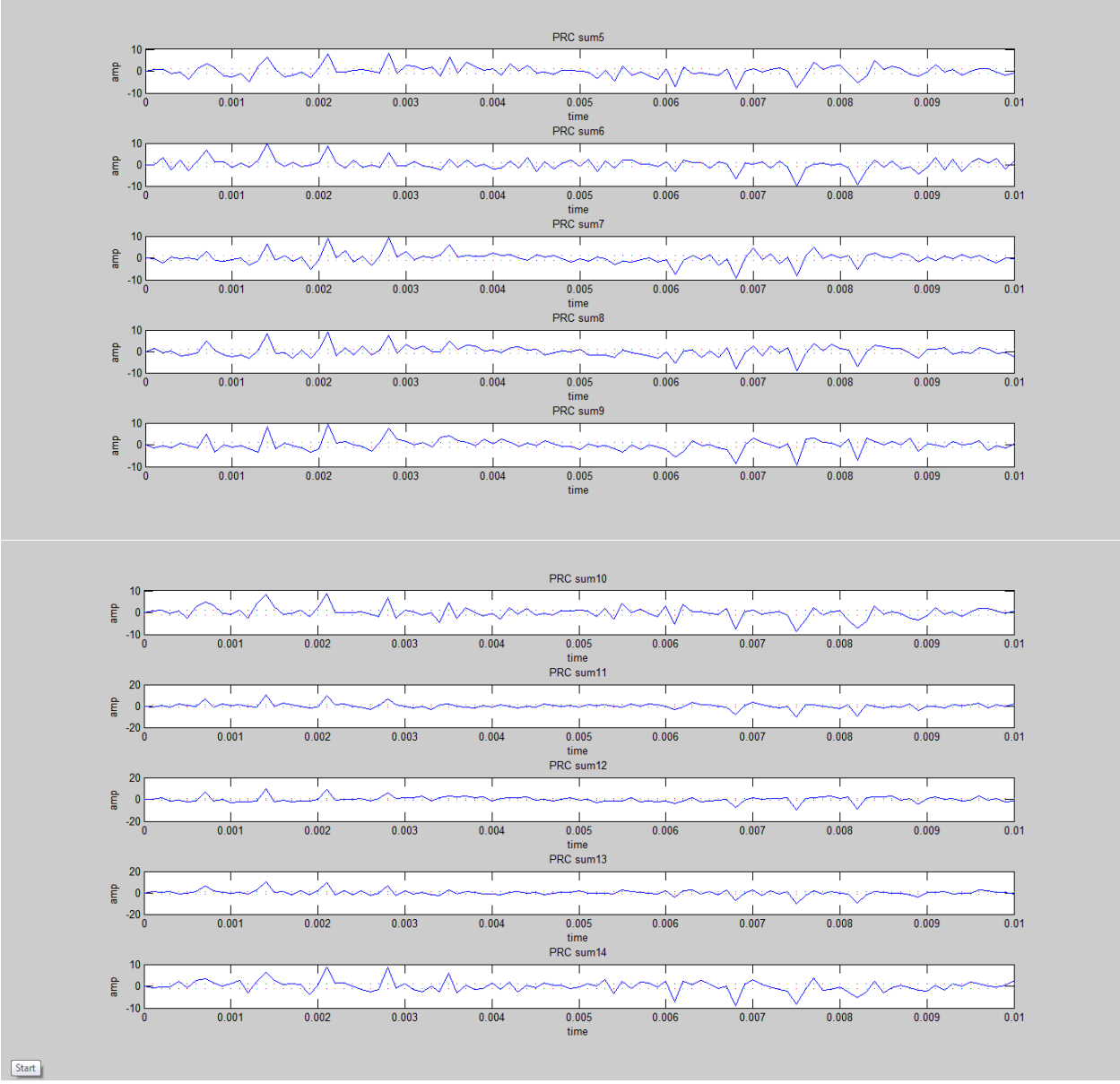

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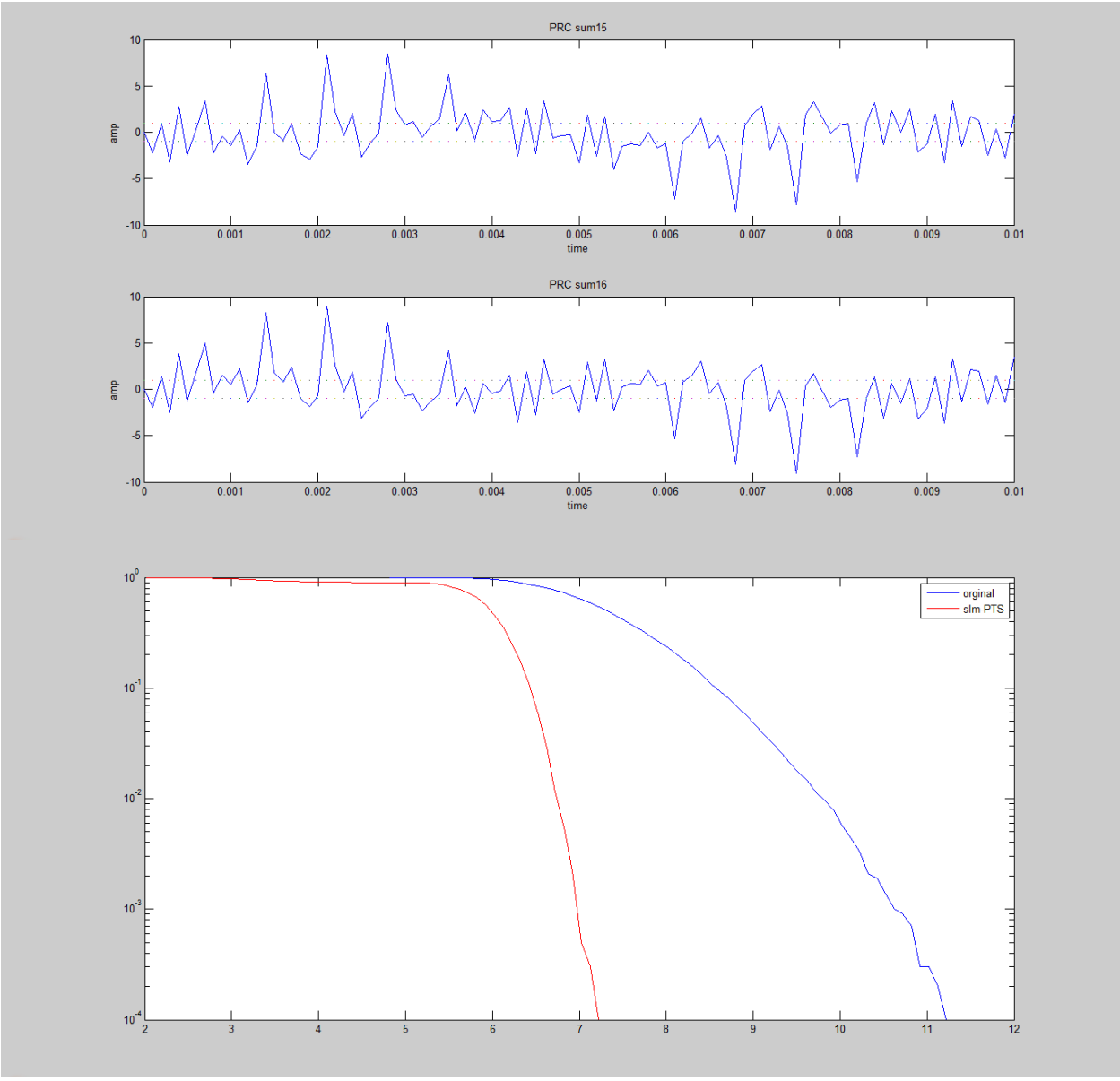

4 CONCLUSION

This paper represents the three suboptimal algorithms namely hexagonal constellation TI, cross entropy based TI and clipping noise based TI for tone injection technique to reduce PAPR in OFDM system. Using hexagonal constellation (HC-TI) we can achieve PAPR reduction without power increase and it is easily applied when constellation size is small. Cross entropy method reduces the computational complexity. It gives significant PAPR reduction

and also obtain optimal computational complexity. The clipping noise based TI easily determines the optimal equivalent constellation. It minimizes number of FFTs requirement. Also the inherent power increase can be effectively avoided by this method.

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