

Comparative Analysis of PAPR Elimination Approaches for SLM and PTS in OFDM Model

SUDESHNA SAHOO¹, PRABHAT KUMAR BARIK²

¹M.Tech Scholar, Dept of I&E Engineering, College of Engineering and Technology Bhubaneswar, India

²Assistant Professor, Dept of I&E Engineering, College of Engineering and Technology Bhubaneswar, India

Abstract - The Orthogonal Frequency Division (OFDM) multiplexing is a method of communication strategy for digitization. This aims to encrypt physical data for the multi-carrier frequencies. Key downside of OFDM is mid to back-average force produced in a small sign. In this paper we compared the two types of PAPR reduction techniques in OFDM. Limited communication sequence(PTS) and selective mapping(SLM) strategies are explored in depth in categorical terms. Comparison of these approaches to the OFDM framework have minimal PAPR meaning. The simulation result describes selective mapping technique (SLM) as being more effective than partial sequence(PTS) transmission. The research is performed using MATLAB.

Key Words: PAPR, OFDM, SLM, PTS, MATLAB

1. INTRODUCTION

Multiplexing is a very effective medium for today's wifi communication within the Orthogonal Frequency Division[1]. Orthogonal Frequency Division Multiplexing is a method where a single network transmission at non-identical frequencies is broken into multiple, restricted path channels to prevent transmission interference. Multiplexing in an orthogonal frequency distribution (OFDM) has many advantages, such as the ability of a single carrier channel to withstand extreme channel conditions without an equalizer filter compound. OFDM technique is commonly used as a standard of numerous wireless networking systems such as optical signal delivery (Dollop) and Autodesk 802.11a area network field Orthogonal Multiplexing Frequency Division (OFDM) is often known as multiplexing regulation; this modulation exercises certain carrier signals such as frequency and delivers a limited number of bits in each channel[2]. The multi-carrier number is split into subcarrier N. In the time domain all sub-carriers are linked to each other. Once considerably higher than the mean potential is integrated, they produce power usage. The peak to average power ratio(PAPR) is labeled N times higher than normal output[1]. The maximized to average output ratio includes costly low-speed (Altitude) amplifier high-frequency transmitters[1]. The improvement in PAPR gives rise to other deficiencies, such as increased efficiency of analog to-digital converters and digital to-analog converters, and eliminates the power impact of Operational amplifiers[1]. PAPR is established in OFDM due to the presence of several specific sub-carriers. The high elevated-peak signal

generated cannot be transmitted to the transmitter without a decrease in peak values. Then the peak frequency of the high amplitude must be decreased before sending the signal. Several numbers of PAPR issue transaction techniques have been established. PAPR elimination methods used in OFDM are as follows:-

Oscillation of clipping and examination, sound reservation, sound integration, robust constellation rise, marginal mapping(SLM), partial sequence transmission(PTS), and gradual flipping algorithm[2]. These techniques eliminate PAPR which enhances the transmitted signal, affects the concentration of bit error (BER), loss of data rate, and decreases algorithm sophistication.

Selective mapping can be used in the selective mapping (SLM) technique to maximize the peak-to - average network bandwidth of multiplexing transmission and distribution systems. It takes the input data and generates the OFDM signal which produces N number of PAPR values by selecting the least PAPR value in the OFDM system[3] by conducting mapping procedure. A collected data is separated into N sub-block number[1] in the partial transmission sequence(PTS) strategy. In each micro-block, sub-carriers have a transition parameter which provides unique impulses with much the same in the original signal[3].

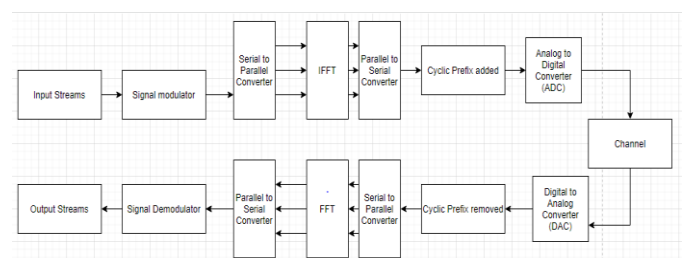


Fig.1. Block Diagram of OFDM System

2. PEAK-TO-AVERAGE POWER RATIO (PAPR)

An OFDM has a strong peak to average power (PAPR) ratio. The voltage gain of the device is indeed quite significant compared to a typical of the whole network, owing to the existence of a large proportion of autonomously Sub-carriers stored on an OFDM system[4]. The PAPR can be represented as interfering with the OFDM signal's modified power to a given OFDM signal's peak output. The peak to-low power ratio is known as peak to-minimum output ratio [5]. PAPR

occurs in OFDM where it seems that the multiplexing network and its cross-carriers are out of step among themselves. The sub-carriers and multi-carriers are supposed to be present at various locations with specific phase values[6]. In OFDM the minimum PAPR value should be 12dB. The main drawbacks of a strong PAPR are:-

- a. In Digital to Analog and Digital to Analog converters Convolution is growing[7].
- b. Amplifiers to radio frequency(RF) reduce efficiency[8].
- c. PAPR rise reduces the element for the production of OFDM signals. This causes the amplifier to conduct unusual area. Consequently, the signal is misrepresented, and hence the amplification contributes to further power usage.

The PAPR is a relation between the sample's maximum power in an OFDM transmission symbol and the transmission symbol specified as the OFDM 's average intensity in a certain OFDM. PAPR happens where the numerous sub companies are out of step with each other in a multi-carrier network. At different phase values they are different with respect to each other at each instant. Unless all the output exceeds the highest value at the same moment, the output envelope would unexpectedly exceed the limit resulting in a increase in the output envelope. The peak value of the network may be very strong because of the existence in an OFDM environment of vast amounts of independently modulated suppliers. Coherent application of same-phase N signals creates a value that is N times the average signal

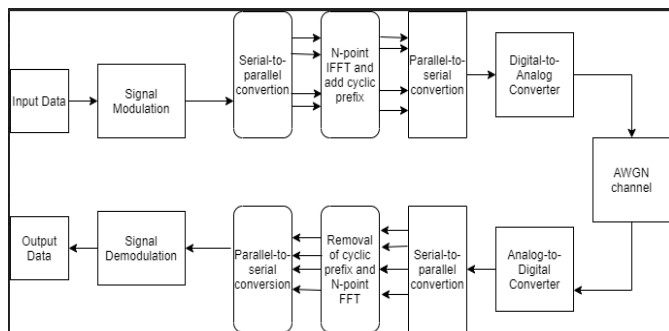


Fig.2. Block Diagram of PAPR in OFDM system

Source data is collected in Peak-to - Average Power Ratio (PAPR) where the signal is increased and translated from serial to parallel and N-point IFFT is produced and the carrier signal is tried to apply once it is transmitted from parallel to serial signal that the signal is again distributed to the digital signal that is converted into analog signal. The analog signal is improved by the introduction of AWGN line to a digital signal, which will then be converted from serial to parallel converter. Once the N-point FFT and the sinusoidal prefix are eliminated and the decoding of the signal is removed and the output information is provided. The transmitted signal from OFDM delivers a high peak power when IFFT summation is conducted in the same phase. As

this signal produces the characteristics of the High Power Amplifier, an out-of-band radiation is produced which divides the signal into separate sections of the bands. The performance of PAPR reducing techniques is detected mainly by two points:-CCDF (complementary cumulative distribution function) and BER(bit error rate). PAPR reduction includes many schemes that are largely based on spectral efficiency, data rate loss etc.

3. OFDM SYSTEM MODEL AND PAPR

A set of simultaneous input data observations are first modulated in OFDM systems (e.g. Quadrature Phase Shift Keying) and then integrated with IFFT on the transmitter side. IFFT is used to extract orthogonal data from subcarriers.

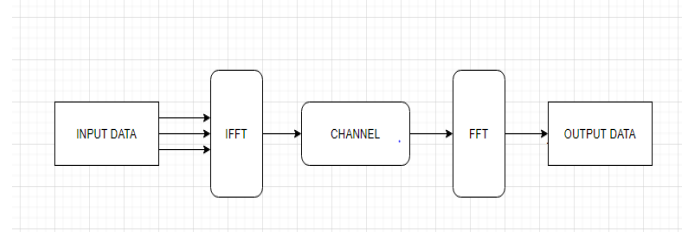


Fig.3 Block Diagram of OFDM and PAPR

PAPR can be determined by the relationship between the peak power of a sample in an OFDM transmit symbol and its mean power by using a significant number of sub - contractor. Consistent use of the same-phase N signals gives a positive impact that is N times the mean signal. PAs are forced into depletion at the transmitter due to high PAPR, which is decreasing the Ger performance. To prevent forcing the PA into saturation the mean signal intensity should be reduced. Nevertheless, this reduces the SNR and hence the BER performance. So solving the high PAPR issue by raising the peak amplitude of the signal is optimal. Numerous methods for raising PAPR have been suggested. Two key considerations generally illustrate the efficiency of a PAPR reduction scheme: the complementary cumulative distributive feature (CCDF), and the bit error rate (BER). The transmitted signal from OFDM delivers a high peak power when IFFT summation is conducted in the same phase. As this signal produces the characteristics of the High Power Amplifier, an out-of-band radiation is produced which divides the signal into separate sections of the bands. The performance of PAPR reducing techniques is detected mainly by two points:-CCDF (complementary cumulative distribution function) and BER(bit error rate). PAPR reduction includes many schemes that are largely based on spectral efficiency, data rate loss etc. We contrasted two forms of PAPR reduction techniques in this paper which are Selective Mapping (SLM) and Partial Transmission Sequence (PTS) techniques.

4. SELECTIVE MAPPING (SLM) TECHNIQUE

Selective mapping (SLM) is the mapping procedure approach used to deduct the peak-to - average strength ratio of the network transmitting multiple carrier wave.

In this method the production of strength is stored as raw data, grouped into different sub-blocks[9]. Such comparison voltage is then amplified by step-shifting variables, supplying an OFDM signal with increasing force stimulation. Therefore, by encoding stage, we pick the OFDM signal which incorporates the cheapest PAPR.

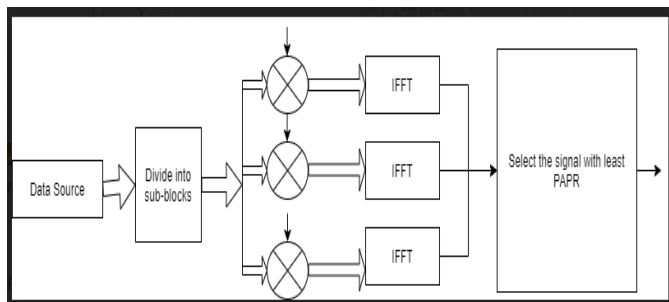


Fig.4. Block Diagram of SLM Technique in OFDM System

Under addition, the SLM algorithm can be summarized to:

- The alert shows the incoming testable forecast.
- The input data is broken down into the N-number sub block.
- Multiply such sub-blocks with a step series.
- The OFDM signal is then produced at each signal.
- The OFDM signal is then known initially as the minimum PAPR.

Throughout the selective mapping method the original data provided as input to the device is divided into several blocks From which the signal is derived for conveying with the lowest weighted PAPR.

The step factor that can then be given as a input to IFFT signals that produces individual PAPR signals is multiplied with each data layer. Of those signals, the signal is defined through the mapping step with Optimum of PAPR value. The amount of step sequences in selective mapping technique continues to increase which helps the SLM eliminates computing difficulty accomplished. The technique contrasts with the original OFDM signal which includes the Quick Fourier Inverse Transform (IFFT) to remove the OFDM output.

5. PARTIAL TRANSMIT SEQUENCE (PTS) TECHNIQUE

Part transmission sequences (PTS) are an effective method for obtaining a highly crucial peak-to - average power ratio

(PAPR) using the orthogonal multiplexing frequency division (OFDM). The number of signals received by PTS are divided into several sub-blocks and the OFDM signal is then developed in each signal. The optimal signal with the lowest PAPR is then defined.

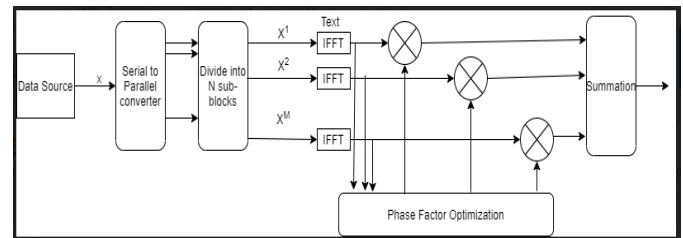


Fig.5. Block Diagram of PTS Technique in OFDM System

The PTS algorithm can be summarized to:

- Feedback of the source data given to us as a warning.
- PTS converts the signal from parallel to serial converter.
- The signal converted is then divided into sub-block numbers N.
- Subtract the phase factor for every signal to receive the OFDM signal.
- The OFDM signal with the lowest PAPR is defined after the optimization of the phase component.

6. RESULT ANALYSIS

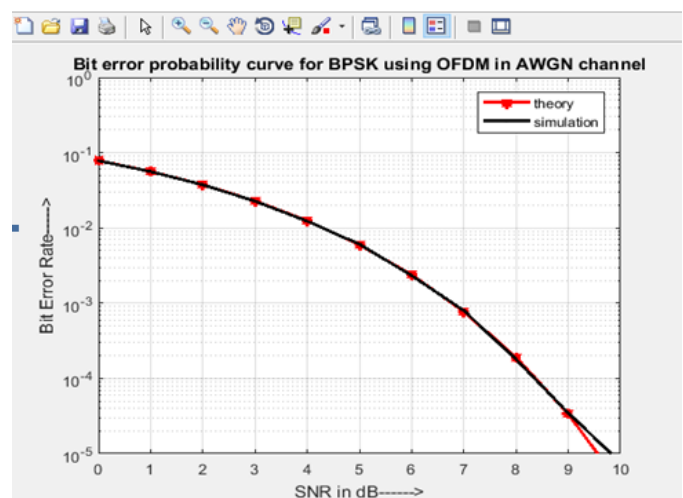


Fig.6. BER vs SNR curve of BPSK in OFDM system

In this Fig.6 we have taken the Binary Phase Shift Keying (BPSK) modulation scheme in OFDM system and compared the Bit error rate with the signal to noise ratio(SNR) in dB. The curve shows the theoretical and simulated value of BPSK modulation in OFDM system. This modulated scheme is further used to detect the PAPR in OFDM.

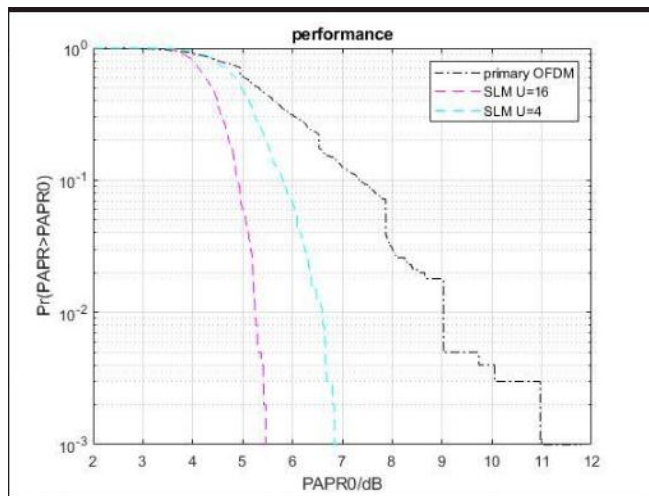


Fig.7. PAPR Reduction performance in SLM (U=16,4) in OFDM System

In this Fig.7 the primary OFDM is compared with one of the PAPR reduction technique i.e., Selective Mapping (SLM) technique. In this technique we have taken number of sub-blocks $U=16,4$, $N=1000$ parallel channel=32 which is compared with the primary OFDM signal. Here we got to know that by increasing the number of sub-blocks i.e., $U=4,16$ the PAPR reduces.

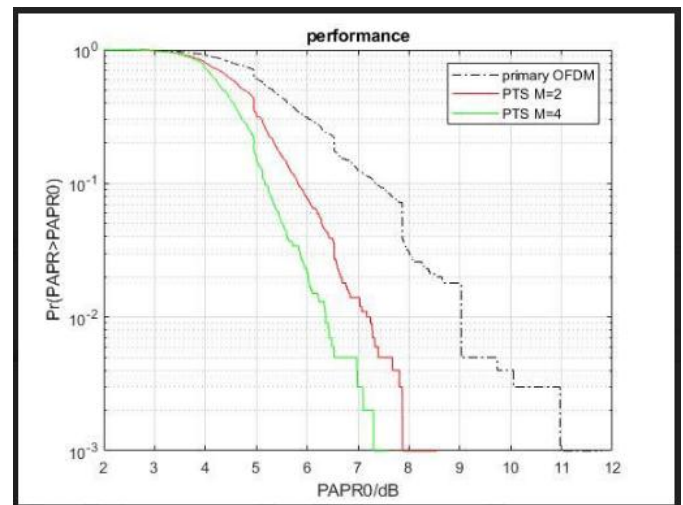


Fig.9. PAPR Reduction performance of PTS (M=2,4) in OFDM System

This Fig.9 integrates a new PAPR reduction technology with the Primary OFDM, i.e., Partial Transmission Sequence (PTS) technique. The signal is divided into N-number of the substrates in this technique that are then multiplied with the phase factor. In this instance the PAPR decreases as the number of subblocks increases. We took $N=1000$, parallel channel = 32 $M = 2,4$.

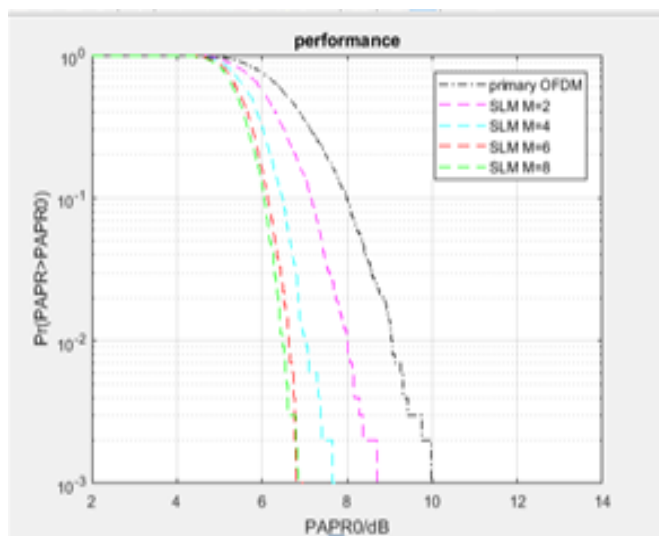


Fig.8. PAPR Reduction performance of SLM (M=2,4,6,8) in OFDM System

In this Fig.8 we have further increased the number of sub-blocks in Selective Mapping Technique i.e., $M=2,4,6,8$, $N=1000$, parallel channel=32 we have taken more number of signals here to exagurate the PAPR reduction efficiently in OFDM system. Then its is compared with the OFDM signal which shows that PAPR reduces with increase sub-blocks.

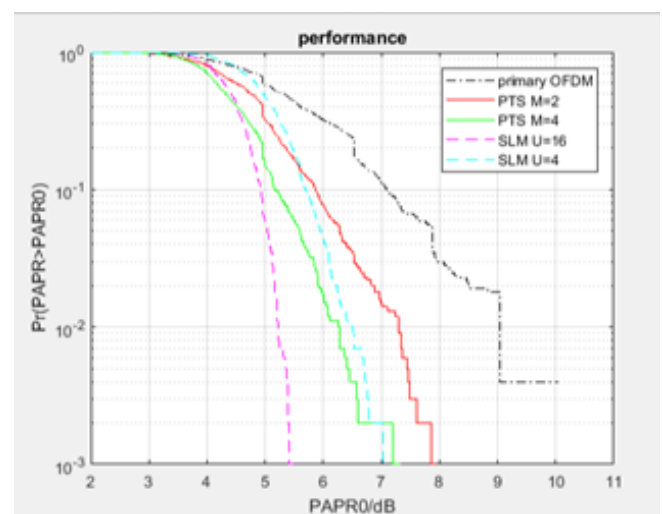


Fig.10. Comparison of SLM and PTS techniques in OFDM System

Then eventually in Fig.10 both the SLM and PTS schemes are linked to the OFDM signal we bring it into. SLM technique offers extra PAPR reduction benefit equal to PTS technique. When we increase the SLM signal frequency, it gives the signal a higher decreased PAPR value.

7. CONCLUSIONS

We used two aspects of PAPR elimination measures in this report, that is. Selective (SLM) and partial (PTS) mapping techniques, next to the OFDM signal. By introducing the above differentiation, we are informed that the Selective Mapping Approach may be the most efficient method that gives the OFDM reduction in PAPR a better benefit. When you move up the sub block number, i.e., $M=2,4,6$, the PAPR value decreases. Thus, for PAPR reduction in the OFDM System, we specified that the SLM framework should be correctly implemented.

ACKNOWLEDGEMENT

I would like to express my warm appreciation for your invaluable assistance and guidance to my esteemed Mr. Prabhat Kumar Barik, Deputy Professors, I&E department. I have a profound responsibility for him to advise me on implementation of this project.

REFERENCES

- [1] Manoranjan Rai Bharti, Kamal Singh, Sudhanshu Jamwal, E&CE NIT Hamirpur Hamirpur District, India. "A tailored reduction of PAPR focused on strategies for SLM and PTS."
- [2] Dishant Khosla, Landran, Sohni Singh "OFDM Modulation and its Implementations"
- [3] PAPR elimination program for OFDM: Sandeep Bhada, PankajGulhaneb, A.S.Hiwalec.
- [4] Yasmin Hassan, Mohammad-El-Tarhuni, Department of Electrical Engineering, American University of Sharjah, United Arab Emirates Sarjah, "Peak-to - Average Power Ratio Schemes for OFDM Systems Analysis of SLM and PTS."
- [5] Amit Nayak, Anjana Goen, 'A study of OFDM's PAPR elimination strategies.'International Journal of Applied Study in Electrical Engineering, Circuitry, and Instrumentation.
- [6] Sudeshna Sahoo, Prabhat Kumar Barik, " Comparative View of SLM And PTS PAPR Reduction Techniques In OFDM System", International Journal for Science and Advance Research in Technology
- [7] Binny Parida, "Use of social network for recommending job by applying machine learning techniques," International Research Journal of Engineering and Technology
- [8] Sumanta Kumar Singh, "Estimation of calorie content in a diet using Bigdata,"IRJET
- [9] Sumanta Kumar Singh, "Rain Fall Prediction using Bigdata analytics," IJJET,