IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 17, Issue 4, Ver. IV (July – Aug. 2015), PP 61-64
www.iosrjournals.org

PAPR Reduction in OFDM Model

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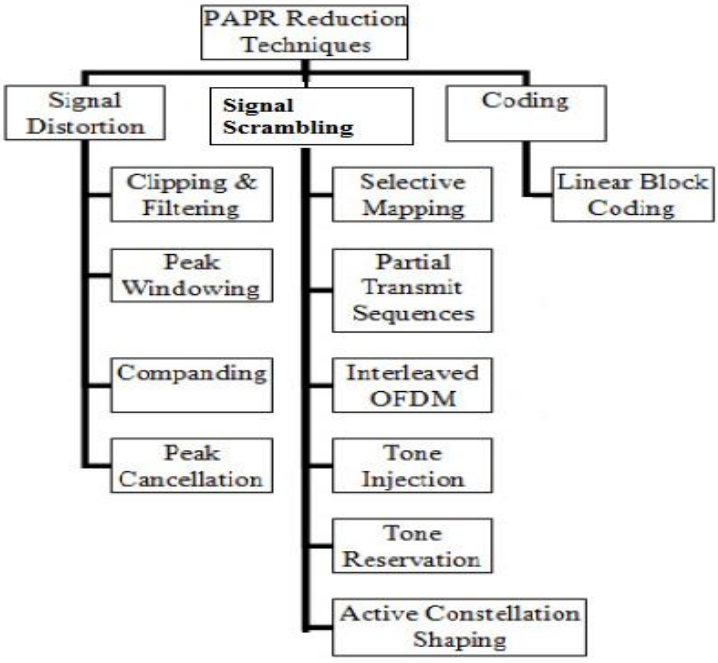
Abstract: *Multipath reflects the signal with different phases. The best solution of multipath fading is OFDM.Orthogonal frequency division multiplexing (OFDM) has been focused on in high data rate wireless communication research. But the high peak to average power ratio (PAPR) is one of the main obstacles of OFDM. For better transmission, even single – carrier waves are being replaced by multi – carriers. Multi carrier systems like CDMA and OFDM. In the OFDM system, orthogonally placed sub – carriers are used to carry the data from the transmitter end to the receiver end. Presence of guard band in this system deals with the problem of ISI. . But the large Peak – to – Average Power Ratio of these signal have some undesirable effects on the system.*

Keywords: *OFDM, PAPR, CCDF, Multipath fading, BER.*

I. Introduction

Orthogonal Frequency Division Multiplexing (OFDM) is a method of digital modulation. Which signal is split into several narrowband channels at different frequencies. OFDM is a special case of multicarrier transmission, where a single data stream is transmitted over a no. of lower rate subcarrier. OFDM has been standardized as part of the IEEE 802.11a and IEEE 802.11g for high bit rate data transmission over wireless LANs [1]. OFDM introduces inter-symbol interference (ISI) and inter-carrier interference (ICI).Inter symbol interference (ISI) is eliminated almost completely by introducing a guard time in every OFDM symbol. This technique has been adopted for a number of applications such as the standard for digital audio broadcasting (DAB), digital video broadcasting (DVB), HIPERLAN/2, Wireless LAN (IEEE802.11x) and WiMax, etc [2]. High peak to average power ratio (PAPR) is the major drawback of multicarrier transmission. It is a Evolution of Frequency Division Multiplexing (FDM) Frequency Division Multiplexing (FDM) has been used for a long time to carry more than one signal over a telephone line. FDM divides the channel bandwidth into sub channels and transmits multiple relatively low rate signals by carrying each signal on a separate carrier frequency. To ensure that the signal of one sub channel did not overlap with the signal from an adjacent one, some guard-band was left between the different sub channels. Obviously, this guard-band led to inefficiencies.

Papr Reduction Techniques



1.Signal Distortion

1.1 Clipping & Filtering

A threshold value of the amplitude is set in this process and any sub-carrier having amplitude more than that value is clipped or that sub-carrier is filtered to bring out a lower PAPR value.

1.2 Peak Windowing

Peak windowing reduces PAPRs at the cost of increasing the BER and out-of-band radiation. In peak windowing method we multiply large signal peak with a specific window, for example; Gaussian shaped window, cosine, Kaiser and Hamming window.

II. Signal Scrambling Techniques

2.1 Selected Mapping

In this a set of different data blocks representing the information same as the original data blocks are selected. Selection of data blocks with low PAPR value makes it suitable for transmission.

2.2 Partial Transmit Sequence

Transmitting only part of data of varying sub-carrier which covers all the information to be sent in the signal as a whole is called Partial Transmit Sequence Technique.

2.3 Interleaving

The notion that highly correlated data structures have large PAPR can be reduced, if long correlation pattern is broken down. The basic idea in adaptive interleaving is to set up an initial terminating threshold. PAPR value goes below the threshold rather than seeking each interleaved sequences.

2.4Tone Reservation (TR)

The main idea of this method is to keep a small set of tones for PAPR reduction. This can be originated as a convex problem and this problem can be solved accurately.. Tone reservation method is based on adding a data block and time domain signal. A data block is dependent time domain signal to the original multicarrier signal to minimize the high peak.

2.5 Tone Injection (TI)

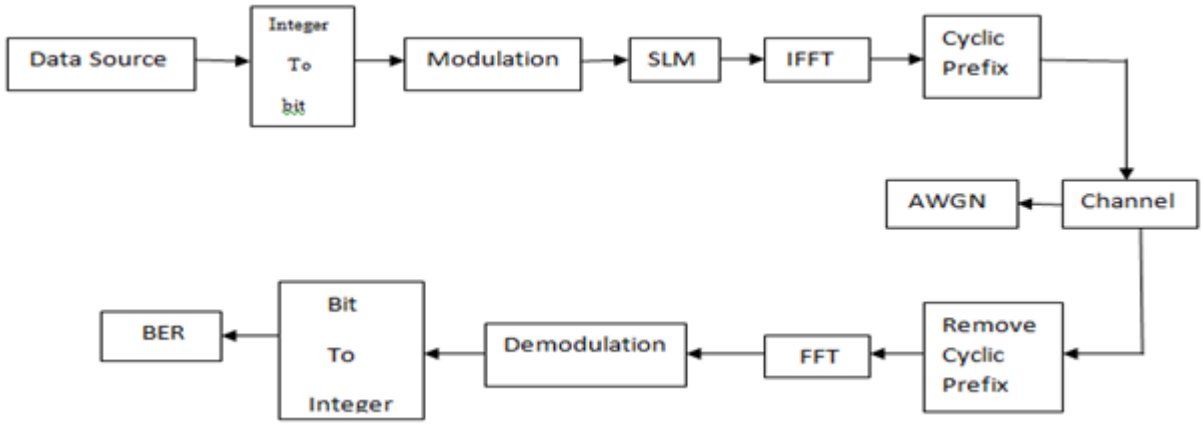
It is based on additive method for PAPR reduction. Using an additive method achieves PAPR reduction of multicarrier signal without any data rate loss. It uses a set of equivalent constellation points for an original constellation points to reduce PAPR.

III. Coding

3.1Block Coding

The fundamental idea is that of all probable message symbols, only those which have law peak power will be chosen by coding as valid code words for transmission.

IV. Proposed Work



- OFDM – It is used to improve the speed and efficiency of the System.
- Analog to Digital Converter – It converts the data from integer to bit.
- Modulation – Signal to be transmitted with a fixed band and here carrier plays a major role.
- SLM Mapper – It is used for multiply and to reverse the speed.
- IFFT – It converts the data from time to frequency domain. It reduces ISI.
- Cyclic Prefix – It reduces ICI (inter carrier interface).
- AWGN Channel – It acts as carrier which carries the signal from transmission.
- FFT - It converts the data from frequency to time domain. it reduces ISI

V. Simulation Results

The main objective of this paper is to implement a user Interface for the study of OFDM processing which is shown in fig. A Simulink model for 16-QAM,64-QAM technique is shown in fig. On the basis of model of 16-QAM,64-QAM techniques, This GUI enables us to examine the variation of Bit error rate against the different values of Signal to Noise ratio.

1. Simulation Results for OFDM with 16-QAM

The entire simulation process to be carried out is similar to that of OFDM with QAM scheme. For particular SNR value system is simulated and corresponding probability of error (Bit Error Rate, BER) is calculated .

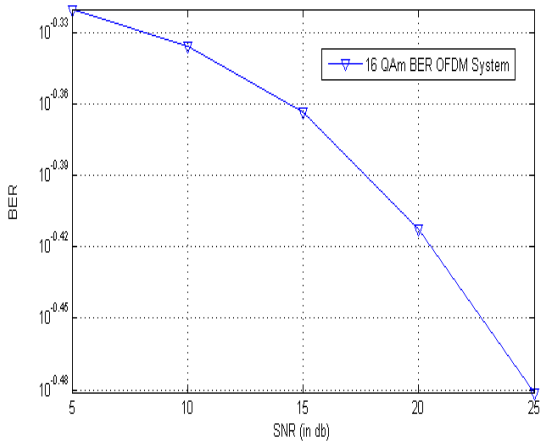


Fig.1 16 QAM

2. Simulation Results for OFDM with 64-QAM

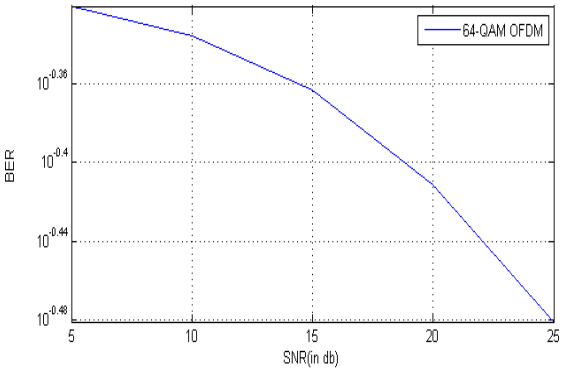


Fig.2 64 QAM

3. Comparison Of Ofdm Systems With 16-Qam And 64-Qam

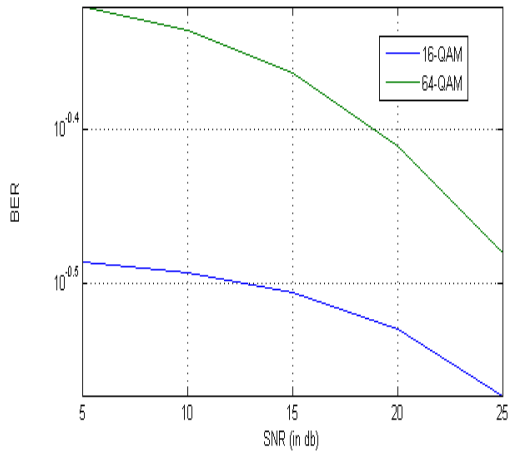


Fig.3 16 & 64 QAM

After applying the proposed technique on the above database following observations has been concluded on the basis of PAPR.

QAM	SNR	BER	PAPR
16	15db	0.3119	5.65
64	15db	0.4332	3.414

Table1. Results based on PAPR

VI. Conclusion

Basically as the information about all above described techniques to reduce the PAPR in OFDM system. We are not achieving large reduction in PAPR with high frequency efficiency, low complexity and good error correction. In this modulation if phase shift angle 180 then the system goes declined as per bit error rate increases. We have achieved different -2 values and have plot the graph applications and extentions.

Acknowledgements

As we know that whenever we are going to do something new we have to face many obstacles and of course many new experiences too. To introduce a new thing is not an easy task for anybody. We pay our gratitude to the management for their wholehearted cooperation and guidance to make this Thesis. We wish to acknowledge our deep sense of gratitude and personal regard to Thesis guide "**Er. Rajnish Kansal**"for her valuable guidance in the completion of our Thesis. We feel great pleasure in presenting this Thesis on "**PAPR Reduction Techniques in WiMax OFDM MODEL"**. We have applied our concentration, alteration and best efforts to present this project in simplest way. At last, we would like to thank "**Er. Rajnish Kansal**" who has been source of continuous inspiration and support for us. Her unique talent and ability helped us a lot.

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