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Survey Paper on PAPR Reduction Techniques in WiMax OFDM MODEL

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Abstract- Multipath reflects the signal with different phases and time arrivals .The best solution of the multipath fading is OFDM. Orthogonal Frequency Division Multiplexing (OFDM) is a multicarrier modulation technique for high speed data transmission over multipath fading channels for wireless communication. One of the main problem is high peak to average power ratio (PAPR) which leads to power inefficiency in RF section of the transmitter. Several methods have been proposed to reduce the PAPR.

Keywords – OFDM, PAPR, CCDF, Multipath fading, BER

I. INTRODUCTION

A. OFDM

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).Intersymbol 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.

B. DEVELOPMENT OF OFDM SYSTEMS

The development of OFDM systems can be divided into three parts. This comprises of Frequency Division Multicarrier Communication and Orthogonal Frequency Division Multiplexing.

1) Frequency Division Multiplexing

In which Signals are combined for transmission on a single communication line or channel .Each Signal is assigned a different frequency with in the main channel. A gap or guard band has to be inserted to avoid adjacent channel interference (ACI).It is used in a communication network ,each input signal is sent and received at maximum speed at all times.

2) *Multicarrier Communication*

To transmit the data by splitting it into several components and sending each of these components over separate carrier signals. Each of these signals are individually modulated and transmitted over the channel. At the receiver end, these signals are fed to a de – multiplexer where it is demodulated and re – combined to obtain the original signal.

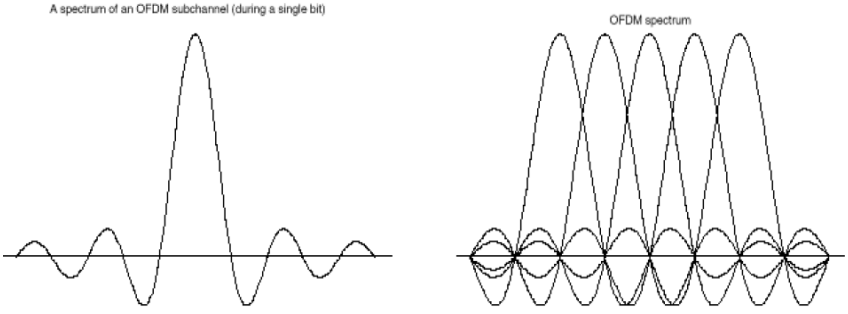


Fig 3.1 OFDM Spectrum

II. PAPR

PAPR can be described by its complementary cumulative distribution function (CCDF). PAPR is defined as the maximum power occurring in the OFDM transmission to the average power of the OFDM transmission.

$$PAPR = \frac{P_{peak}}{P_{average}} = \frac{\max [|x_n|^2]}{E [|x_n|^2]}$$

Where, P_{peak} = Peak power of the OFDM system

$P_{average}$ = average power of the OFDM system.

A large PAPR increases the complexity 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

III. CCDF OF PAPR

The cumulative distribution function (CDF) is one of the most regularly used parameters, which is used to measure the efficiency of any PAPR Technique. The cumulative distributed function
(CDF) of the signal is

$$F(z) = 1 - \exp(z)$$

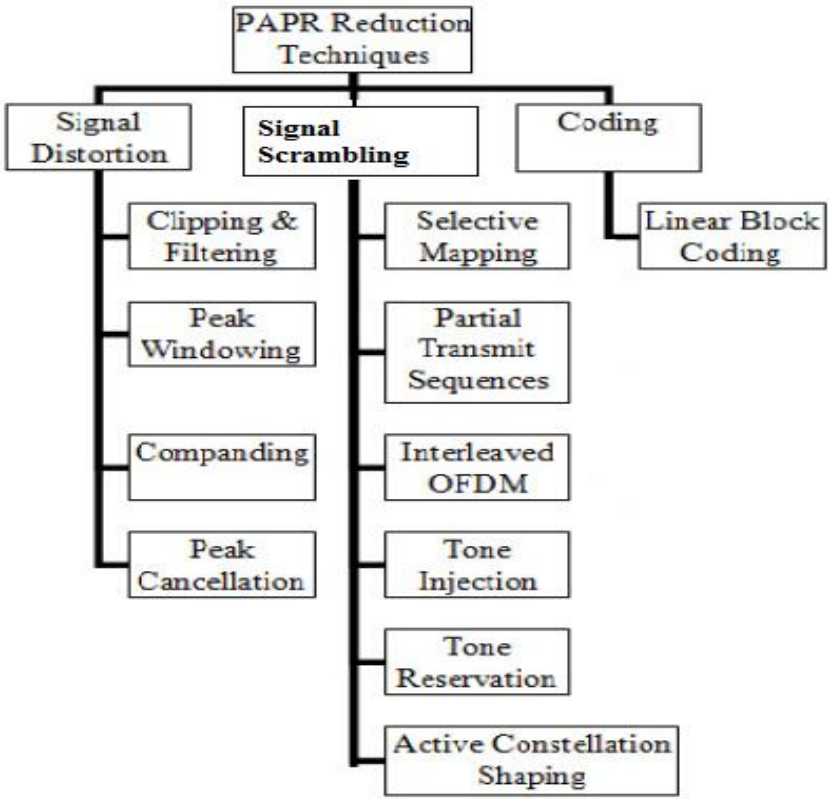
The complementary cumulative distributed function (CCDF) is used instead of CDF which helps us to measure the probability that the PAPR of a certain data block exceeds the given threshold.

$$P(PAPR > z) = 1 - P(PAPR \leq z)$$

$$= 1 - F(z) N$$

$$= 1 - (1 - \exp(-z)) N$$

PAPR Reduction Techniques



A. Signal Distortion

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.

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.

B. Signal Scrambling Techniques

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) 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.

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.

4) Tone 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.

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.

C. Coding

1) Block 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. CONCLUSIONS

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

ACKNOWLEDGMENT

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REFERENCES

[1] M. Schwartz, Mobile Wireless Communications. Cambridge University Press, 2005.

[2] Tao Jiang and Yiyan Wu,"AnOverview: Peak to Average power Ratio Reduction Techniques for OFDM signals", *IEEE Transactionon Broadcasting*, Vol.54, no.2, 2008,pp.257-268.

[3] S. H. Han, J. H. Lee, "An Overview of Peak – to – Average Power Ratio Reduction Techniques for Multicarrier Transmission", *IEEE Transaction on Wireless Communication*, April 2005.

[4] D. Gerakoulis; P.Salmi. "An interference suppressing OFDM system for wireless communications," ICC 2002. IEEE International Conference onCommun. YoU, pp.480-484, 2010.

[5] Cherif Rezgui, Slaheddine Jarboui –"A PAPR reduction technique based on Golay sequences and Fractional Fourier Transform for OFDM Systems", 2012 IEEE

[6] Reena Chackochan, Dr. Himanshu Soni – "Peak to Average Power Ratio (PAPR) Reduction in OFDM for a WLAN network Using SLM Technique" – 2011 IEEE

[7] Prashant Pandey, Rajeev Tripathi – "Performance Analysis of Peak-to- Average Power Ratio (PAPR) Reduction Techniques in an OFDM System"- 2012 IEEE

[8] Tung-Chun Hsueh, Ping-You Lin and Jung-Shan Lin –"PAPR REDUCTION TECHNIQUES WITH CROSS SLM SCHEMES FOR MIMO-OFDM SYSTEMS - 2012 IEEE.

[9] Yasir Rahmatallah, Seshadri Mohan – "Peak-To-Average Power Ratio Reduction in OFDM Systems"- 2013 IEEE

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