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PAPR Reduction Technique In OFDM

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ABSTRACT

Orthogonal Frequency Division Multiplexing (OFDM) is a multicarrier transmission scheme it transmits large data over radio wave. PAPR is one of the disadvantage of OFDM system. (Peak to average power ratio) PAPR is nothing but several sinusoidal leads. This paper presents overview of different techniques used to reduce PAPR in OFDM system.These Proposed different techniques of reduction of PAPR gives better performance.

Keywords: Peak to Average Power Ratio, Orthogonal Frequency Division Multiplexing (OFDM)

I. INTRODUCTION

Orthogonal frequency division multiplexing (OFDM) is multicarrier multiplexing access scheme for Transmitting Large data over carriers. Future mobile Generation system is expected to offer high data rate to meet the requirement for future multimedia application. The data rate required for 4G System is 10-20Mbps & at least 2Mbps in moving vehicles And modulation technique used by 4G system is OFDM. One of the drawback of OFDM system is PAPR (Peak to Average Power Ratio). For transmission of information this PAPR need to be reduced. To reduce PAPR of OFDM system many different techniques are used. In this Paper different techniques are explained which can be used to reduce PAPR in OFDM system.

PAPR Problem & Requirement of Reduction

OFDM system is very efficient modulation scheme in wireless communication, but one of the major drawbacks of the OFDM high PAPR (Peak-to-Average Power ratio). PAPR is randomly sinusoidal leads occurred during transmission of the OFDM to reduction of PAPR is important point in the OFDM system. Because of when we are discussing about the high speed data communication in real life like high speed internet access, video calling and Digital audio broadcasting (DAB), Microwave terrestrial television, digital video broadcasting (DVB), 4G system, hyper LAN. Therefore as if we see most of the communication systems required high data rate. But high PAPR in OFDM system prevent these types of facilities in the real life. So it is necessary to reduce PAPR in OFDM system.

PAPR Reduction Techniques

Different PAPR reduction techniques have been proposed in the literature. These techniques are classified into two groups.

- Signal scrambling techniques
- Signal distortion techniques

II. METHODS AND MATERIAL

1. Signal Scrambling Technique

B. Block Coding Techniques

In block coding the basic idea is that in all probable message symbols, only those which have low peak power will be selected by coding as valid code words for transmission and there is distortion of signals. Using QPSK modulation we can represent N subcarriers as 2N bits and thus 22N messages. Zero bits of redundancy associated with whole message space and one bit of redundancy associated with half of message space. The remaining message space is then divided in half again and this procedure continues until N bits of redundancy have been allocated which corresponds to a rate one-half code for N carriers. The long information sequences is divided into different subblocks, and all subblocks

encoded with System on a Programmable Chip (SOPC) by doing this we can achieve large PAPR reduction.

C. Selected mapping (SLM)

A single OFDM sequence D having a length of N, divided into number of sequences that are represent equivalent information with some rotation factors and therefore the sequence with lowest PAPR is transmitted. If U is the number of new generated sequences, called the SLM length, then all these sequences are the result of multiplying the incoming original OFDM sequence D by SLM length U different rotation factors. The performance of SLM approach depends on the length of SLM U and the amount of scrambling done by these rotation factors on the original OFDM sequence. PAPR performance becomes improved if we increase number of SLM sequences but at the expense of increase in system complexity. Although SLM technique exhibits moderate level of implementation complexity, this complexity increases as SLM length U increases.

D. Partial transmit sequence (PTS)

Partial Transmit Sequence (PTS) is one amongst the techniques wont to scale back PAPR in OFDM system. the basic plan of PTS is information blocks ar divided into non overlapping sub-block with freelance rotation issue. exploitation rotation issue time domain information with lowest amplitude is generated. Partial transmit sequence is that the changed technique of SLM which supplies the improved performance than SLM.

E. Linear block codes

In linear block codes distinct U signal is transmitted alongside transmitted sequence. U distinct signal is employed made mistreatment correct choose co –set words. Mistreatment scrambling codes no has to transmit aspect data and received signal is simply decoded. Main factor is that to pick customary array of codes to cut back the PAPR, this method additionally modification of the SLM techniques. during this transmitted signal with minimum PAPR mistreatment scrambling code. Technique has higher performance than SLM technique.

F. Interleaving

In this technique extraordinarily related knowledge frame, during this adaptative technique conjointly reduces the quality. Adaptative interleaving is to see associate early terminating. Therefore the looking out method is terminated once worth of PAPR reaches below the threshold value. So, these low threshold force the AIL to go looking for all interleaving sequence. Compare to PTS the quality of interleaving is a smaller amount or less.

G. Tone Reservation (TR)

In this method, we need to add original signal with an approximate signal so that the PAPR of original signal can reduce. The requirements of this technique are the original signal and the approximate signal both be supposed to lie in disjoint frequency subspaces. i.e. some tones are reserved in original signal to reduce the peaks in signal. The reserved tone does not contain data but the generation of approximate signal is difficult because it contains data symbols in frequency domain. Therefore, a corresponding frequency domain signal is generated and added in the frequency domain signal the equivalent time domain signal is obtained by taking IFFT of the above sum. The total amount of PAPR reduction depends on some factors such as location of the reserved tones, total number of reserved tones, allowed power on reserved tones and amount of complexity. It shows that reserving a small portion of tones leads to great minimization in PAPR ever using with simple algorithm at the transmitter of the system without any additional complexity at the receiver end. The advantage of TR method is side information is not there and also no additional operation is necessary at the receiver of the system and its complexity is less.

H. Tone Injection (TI)

Tone Injection (TI) methodology has been suggested by Muller, S.H., and Huber, J.B. [3]. This method predicated on general additive method for PAPR reduction. Exploitation associate degree additive methodology achieves PAPR reduction of multicarrier signal with none rate loss. TI uses a group of equivalent constellation points for an imaginative constellation points to cut back PAPR. the most plan behind this methodology is to extend the constellation size. Then,

every purpose within the original basic constellation will be mapped into many equivalent points within the extended constellation, since all info parts will be mapped into many equivalent constellation points. These further amounts of freedom will be used for PAPR reduction. The drawbacks of this methodology are; ought to aspect info for decipherment signal at the receiver aspect, and cause additional IFFT operation that is a lot of advanced.

1. Signal Distortion Techniques

Signal distortion techniques are Clipping and Filtering Peak Windowing, Envelope scaling, Clipping and Filtering

A. Clipping & Filtering

Clipping and filtering is one in every of the only strategies of PAPR reduction in OFDM system.In this method, high peaks of the OFDM signal clips before passing it through the power amplifier (PA). if the signal goes outside the predefined level known as clipping level(CL) clipping task is done with the help of clipper that limits the signal envelop clipping level(CL); otherwise clipper passes signal without any change.

Clipping is a nonlinear process therefore it causes distortion and it is source of noise which falls in both in-band and out-of-band distortions. In –band distortion can decreases the BER performance and cannot be reduced by filtering. However, oversampling by taking longer IFFT possible to reduce the in-band distortion effect as portion of the noise is reshaped outside of the signal band that can be removed later by filtering. While spectral spreading caused attributable to out band distortion and it are often removed by filtering the clipped OFDM signal which may preserve the spectral potency and thence it offers the improved BER performance.

Peak windowing technique and clipping technique are similar but in this technique by adding some self-interference and increasing BER we can achieve better performance. Due to this out band radiation is also increased. In this method we multiply large signal peaks with different windows like Kaiser Window Gaussian shaped window, cosine, and Hamming window. OFDM signal is multiplied with several of these windows, convolution of the original OFDM spectrum and the spectrum of the applied window is nothing but resulting spectrum. Means the windows should be narrow as possible. By using this technique PAPR of OFDM system can be reducing to 4db of each subcarrier. Due to signal distortion SNR is limited to 3db.

B. Envelope scaling

This technique is said to scaling, i.e. before OFDM signals sent to the IFFT all subcarrier is scaled the input envelope. In this method 256 subcarrier is employed therefore all subcarrier can remains equal. Main plan is that to theme is that the input envelope in some sub carrier is scaled to attain the littlest quantity of PAPR at the output of the IFFT. Here receiver doesn't would like any aspect info at the receiver finish for decoding. This theme is appropriate for the PSK modulation, when it is applied with the QAM high degradation is occurred in the BER.

III. CONCLUSION

Various different techniques are developed to reduce PAPR in OFDM system and all these techniques have its own merits and demerits. To reduce PAPR in OFDM system all techniques described above are different in their way and using each technique PAPR of OFDM will be reduced at some level. Research is still going to reduce PAPR and to get efficient performance of OFDM system.

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