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Low complexity Peak cancellation scheme for reducing PAPR

Damyanti Kamble[1], Vishal Katekar[2]

[1]*M.E. Student, Dept. of Electronics & Telecommunication Eng., Dr. D.Y.Patil School of Eng. & Technology, Savitribai Phule Pune University, Maharashtra, India;*
[2]*Assistant Professor, Dept. of Electronics & Telecommunication Eng., Dr. D.Y.Patil School of Eng. & Technology, Savitribai Phule Pune University, Maharashtra, India.*

Abstract – *In every communication system the power amplifier is use for transmitting and receiving the signal .The main interest of this paper is implementation of peak cancellation method for multiple signals by using FPGA implementation, For reduction of PAPR of OFDM signal it is one of the simplest method.. In designing, use one ROM is change the multiport ROM, because here use multiple signals. If we use the the digital method for peak cancellation, it cancel unwanted peak directly but it contain some information therefore in this technique add small peak value according to the peak values. For reducing hardware complexity, this peak cancellation scheme is very useful one.*

Key Words: PAPR, OFDM, FPGA, ROM, peak cancellation, crest factor etc.

1. INTRODUCTION

The Orthogonal frequency division multiplexing (OFDM) is a promising solution for high data rate transmission in Frequency-selective fading channels. It is a multicarrier modulation technique that it is extended over a vast in high data rate communication area, including digital subscriber lines (DSL), wireless LAN's, many other emerging wireless broadband system. OFDM is used for high data rate application. It has a efficient and flexible supervision of intersymbol interfence (ISI) in highly dispersive channels. In OFDM system is to use the serial-to-parallel transform to assign the high data rate stream on some of the relative low data rate parallel and orthogonal sub channels Due to the low transmission data rate of the sub-channels, the period to transmit one data symbol is inflamed and it decrease the effect of the multi-path and fading effects of wireless channels on the OFDM system performance.

In the practical, this system required large number of carriers to transmit the data. When these carriers superpose on each other, it will creates a very high peak to average power ratio (PAPR). Very high peak to average ratio in transmitting side is one of the major disadvantage of OFDM, therefore it creates disturbance for long way communication. When the sinusoidal signals of the subcarriers are added then high peaks are occur in OFDM. These high peaks are useful for larger and expensive linear power amplifiers. Since high peaks occur irregularly and infrequently, this means that power amplifiers will be operating inefficiently. A no. of techniques are present for reduction of PAPR problem in OFDM. Such as clipping and filtering, coding-decoding, selective mapping (SLM), partial transmit sequence (PTS) and peak cancellation (PC) technique [4]. PAPR reduction techniques are varyaccording to the needs system and these are dependent on various factors. Which factors are, PAPR reduction capacity, increase power in transmitted signal, loss in data rate, complexity of computation and increase bit-error rate at the receiver end. OFDM is a high transmission technique to combat the influence of wireless fading channels [8]. To reduce this, many approaches have been proposed to reduce the PAPR, among which the pre-distortion approach such as clipping and filtering method , is an efficient one [1]. PAPR reduction technique are applicable to various communications standards. The basic advantage of PC is it's easy for hardware implementation, but it induces in-band distortion and out-of-band radiation. In that we set some threshold value, and the peaks above that threshold is detected and cancelled. [3].

In this paper we also focuses on Multiport ROM concept. Here we set different reference signal for different amplitude. Here we reduce no. of read only memories for different amplitude signals. And use only one multiport read only memory.

2. PEAK CANCELLATION IN OFDM

For reducing PAPR, clipping and filtering and peak cancellation are very simple techniques which have lower complexity, can be considered as more realistic approaches from the viewpoint of practical implementation. These techniques essentially introduce nonlinear operations so that distortions are inevitable. Given that some degree of distortion is generally allowed for the transmitted signals, such techniques are very attractive. The drawback of clipping and filtering method is peak regrowth is generated because of filtering effect, and the amount of regrowth is generally not controllable. Because of peak regrowth it creates the difficulty and complexity for hardware implementation [1]. The

following fig. shows the parallel data signal is then converted in IFFT first then add cyclic prefix of given input signal then this parallel signal get converted in serially and the extra peak is cancelled by peak cancellation method and finally get the better output signal. It can control the Peak to average power ratio and out-of-band radiation simultaneously for additional interference. Orthogonal frequency division multiplexing (OFDM) is a strong and highly transmission technique to combat the influence of wireless fading channels [5].

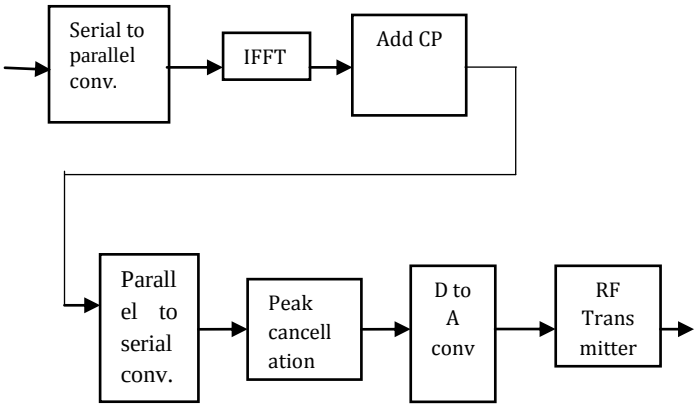


Fig.1: Basic block diagram of Peak cancellation

However, OFDM suffers from high peak-to- average power ratio (PAPR) that significantly reduces the efficiency of the high power amplifier (HPA). To alleviate this, many techniques have been proposed to reduce the PAPR, among which the pre-distortion technique is clipping and filtering, which is an efficient one. Clipping cancels the peak which is adding by a scaled pulse function, at the cost of out-of-band radiation due to the infinite frequency response of the pulse function. To control the PAPR and out-of-band radiation simultaneously, repeated clipping and filtering (RCF) creates a high complexity. To simultaneously make a better trade-off among PAPR, out-of-band radiation and computational complexity, peak cancellation is proposed as a candidate of clipping-based techniques. It introduces to design windowing function, with finite response in time domain and frequency domain also, to replace the original pulse function in clipping and filtering method. In this case, peak cancellation will not cause severe out-of-band radiation, thus it reduce complexity for repeated clipping and filtering.

3. PROPOSED PEAK CANCELLATION SCHEME

Fig 2 shows block diagram of Proposed peak cancellation scheme for reducing PAPR. In this diagram the Peak detector block, which contain some registers and comparators,it detects the magnitude peak, it gives output 1 when magnitude peak is found. The output of peak detect is connected to counter block, which counts the detected pulses by peak detector

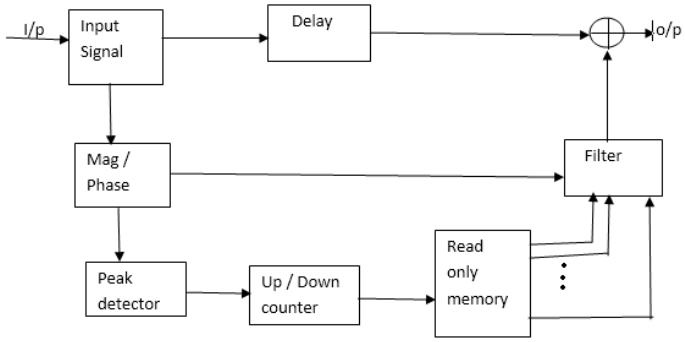


Fig.2 Proposed Peak cancellation scheme

.The counting pulses are stored and addressed to the read only memory.The output of ROM is scaled and rotatedby the latched magnitude and phase to form the cancelling pulses and fed to the FIR filter.These smooth cancelling pulses are substracted from delayed original signal to form the PAPR reduced signal.

O/P peak = I/P peak - detected peak……..(1)

Above expression shows output of reduced PAPR value is equal to the original input siganal minus detected peaks. In this paper we focuses on implementation of peak cancellation for multiple signals in FPGA implementation, which is one of the easiest method of peak cancellation for PAPR reduction. In designing, use one ROM is change the multiport ROM, because here use multiple signals. If we use the digital method for peak cancellation, it cancel unwanted peak directly but it contain some information therefore in this technique add small peak value according to the peak values. In order to reduce hardware complexity, the peak cancellation method is very useful.

4. FLOW DIAGRAM

The flow diagram of PAPR reduction is nothing but reduction of crest factor. The peak cancellation method of Crest Factor Reduction reduces the peak to average power ratio (PAPR) of a signal by subtracting shaped pulses from input signal peaks that exceed a specified threshold. The cancellation pulses are designed to have a spectrum that matches to CFR input signal and therefore introduce negligible out-of-band interference. In general, the crest factor reduction input signal and cancelling peaks are complex, and the peak search is carried out on the signal

Magnitude. Because the signals are complex, each cancellation pulse must be rotated to match the corresponding signal peak. The peak magnitude of a given cancellation pulse is set equal to the difference between the corresponding signal peak magnitude and the desired clipping threshold. This method reduces the signal peak magnitudes to the threshold value while preserving the signal phase.

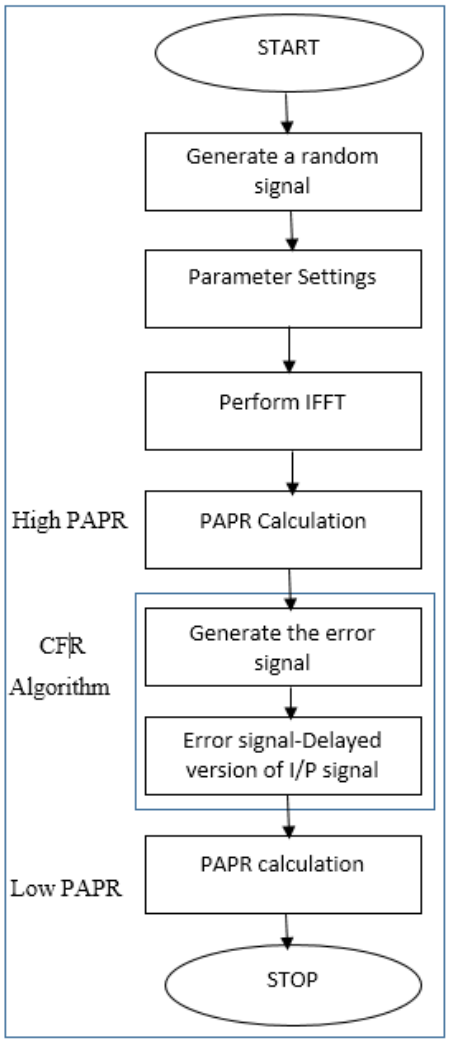
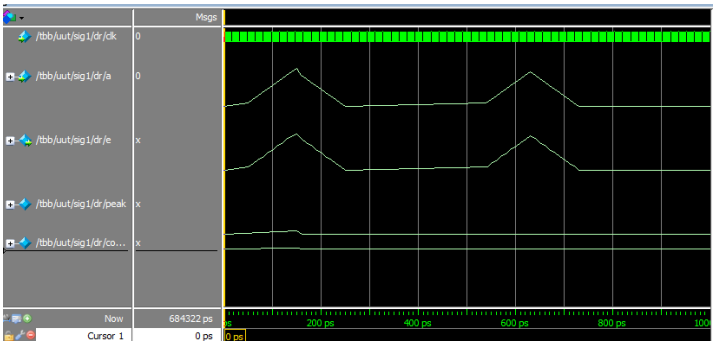


Fig.3 Flow diagram

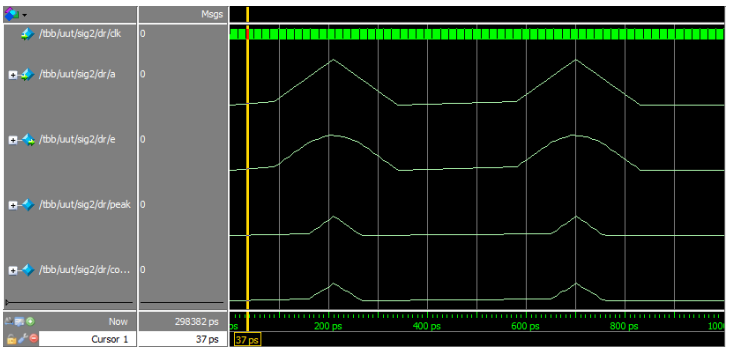
4. RESULTS

The following fig. (1), (2), (3), (4) shows the result of input signal 1,2,3,4 respectively. In that shows the original input signal is subtracted from the average peaks. In that we take four different input signals and take 4 different reference values. Above peaks than the reference signal will be cancelled. And reduce peak to average ratio. Here we set the following reference values-

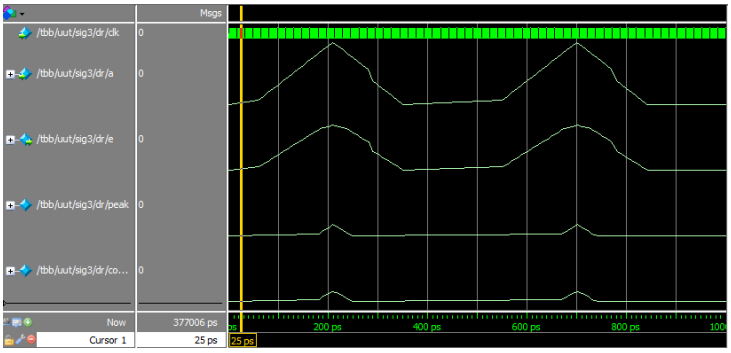
For fig. (1)= set reference value is=20,
For fig. (2)=set reference value is =15,
For fig. (3)= set reference value is= 25,
For fig. (4)= set reference value is= 30.



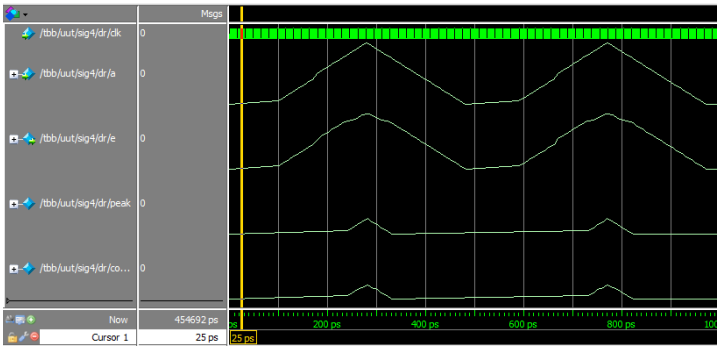
(1)



(2)



(3)



(4)

6. CONCLUSION

In this Paper we have to study the peak cancellation scheme using FPGA implementation. FPGA implementation is used because it increases system performance. The main objective of this paper is to generate an algorithm used to reduce the crest factor. Hence the problem of the power amplifier to move to the saturation region during the encountering of high peak signals can be overcome. The defective issue of ofdm technology is the PAPR problem, so it is very important to improve the high PAPR issue of ofdm signal. Most of the reducing technology for high PAPR needs the complexity calculation. The peak cancellation and detection system is design using the FPGA. The performance system also increase and hardware is decrease .The utilization of the logic gates also less as compare the to previous Papr reduction schemes. In this system only one ROM is use for multiple signal operation. In previous Paper in peak is remove completely but it's contain some information is deleted but in this system peak not remove completely. All the system is design only use the digital once.

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BIOGRAPHIES

M.E.II year Student , Dept. of E & TC Eng., Dr. D.Y.Patil School of Eng. & Technology, Savitribai Phule Pune University, Maharashtra, India.