ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

PAPR Reduction of ODFM by using Shifting Null Subcarriers Among Data Subcarrier &Partial Transmit Sequence

Uddhav Shid[1], R.R.Jagtap[2]

P.G. Student, Department of E & TC Engineering, Annasaheb Dange COE, Ashta Sangali, Maharashtra, India[1]

Professor, Department of E & TC Engineering, Annasaheb Dange COE, Ashta Sangali, Maharashtra, India[2]

ABSTRACT: Different theoretic and hypothesis on determination of PAPR distribution have been reported and various schemes exist to reduce the PAPR. Various schemes could be categorized into Signal distortion schemes or signal scrambling schemes. These techniques achieve PAPR reduction at the expense of increase in transmitting signal power, increase in data rate loss, increase in computational complexity, distortion and channel side information etc. The Signal distortion schemes reduce high peaks by distorting the signal prior to the amplification. Specific approaches include amplitude clipping, filtering and companding. However Signal distortion could cause in-band and out-of-band noise, resulting in system performance degradation. The signal scrambling techniques scramble each ODFM symbol with different scrambling techniques for the PAPR reduction. Specific approaches include partial transmit sequence (PTS) and PTS using adaptive nonlinear estimators, selective mapping technique (SLM), interleaving, active constellation extension, tone reservation (TR), Tone injection (TI)

KEYWORDS: OFDM; Null Subcarriers; PAPR;Null switching; Signal to Noise (SNR)

I. INTRODUCTION

Orthogonal Frequency Divison Multiplexing (OFDM) is a Multi-carrier communication system. It is a special case of Multi-carrier transmission technology, where single data stream is transmitted over a number of lower rate subcarriers instead of the single carrier system. Orthogonal Frequency Divison Multiplexing is an appealing multi-carrier transmission technology for wireless and wire-line communications. OFDM provides resistivity to multipath fading and impulse noise. Bandwidth demand in communication system increases now a day, advance transmission schemes like Orthogonal Frequency Divison Multiplexing has been widely used in Multi-carrier communication systems such as IEEE 802.11, IEEE 802.15, IEEE 802.16, IEEE 802.20, European Telecommunications Standards Institute (ETSI) Broadcast Radio Access Network (BRAN) committees, 3G Long Term Revolution (LTE), worldwide interoperability in microwave access (WiMAX), and digital video broadcasting (DVB). OFDM has one disadvantage of high PAPR value.

II. RELATED WORK

Different theoretic and hypothesis on determination of PAPR distribution have been reported and various schemes exist to reduce the PAPR. Various schemes could be categorized into “Signal distortion ” schemes or “ signal scrambling ” schemes. These techniques achieve PAPR reduction at the expense of increase in transmitting signal power, increase in data rate loss, increase in computational complexity, distortion and channel side information etc.The “Signal distortion ” schemes reduce high peaks by distorting the signal prior to the amplification. Specific approaches include amplitude clipping, filtering and companding. However “Signal distortion ” could cause in-band and out-of-band noise, resulting in system performance degradation.

The signal scrambling techniques scramble each ODFM symbol with different scrambling techniques for the PAPR reduction. Specific approaches include partial transmit sequence (PTS) and PTS using adaptive nonlinear estimators,

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

selective mapping technique (SLM), interleaving, active constellation extension, tone reservation (TR), Tone injection (TI)

A. *PAPR Defination*

Input data sampled on Phase Shift Keying (PSK) or Quadrature Amplitude Modulation (QAM). IFFT at the receiver side and FFT at the transmitter side. IFFT converts the input signal to time domain signal and FFT converts the input signal to frequency domain signal. IFFT is used to produce ODFM signal.Input data samples are random variables and PAPR is the function of input data therefore the PAPR can be calculated by using the level crossing theorem. Level crossing theorem calculates the average number of times that the signal crosses the threshold level. Calculate the Amplitude of OFDM output signals. It's very simple to calculate the probability that the instantaneous amplitude will be above the threshold level. Calculate the Cumulative Distribution Function for different PAPR values.

One of the main disadvantages of ODFM system is the high PAPR ratio of transmitting signals. OFDM signal superimposes many individual subcarriers, when these subcarriers are in the phase of the IFFT input and thus they added to generate the large amplitude corresponding to a high PAPR of the IFFT output.The peak amplitude of the OFDM signal could be N times of a single carrier system, where N denotes the number of subcarriers. Whenever peak magnitude of the OFDM signal exceeds the saturation region of the power amplifier at the transmitter or receiver. Due to high PAPR, Distorted OFDM signal, spectrum spreading, in band & out of band distortion and inter carrier interference will occur in the OFDM system. High PAPR degrades the system performance. All these demote the Bit Error Rate (BER) at the receiver.

B. *Null Subcarriers:*

Null subcarriers are also known as unused subcarriers, they actually not carrying any information. For example, IEEE 802.11a/g has 6 null subcarriers serve as a guard band at the low frequency end and 5 null subcarriers serve as a guard band at the high frequency end. Another example is the mid band null subcarriers for accommodating RF filters in order to avoid delay of DC energy. Consider these null subcarriers for PAPR reduction.

Introduced the Null switching in [] for PAPR reduction. In short, the null switching method is to interchange the data subcarriers with null subcarriers. The computational complexity of the null switching is high whenever the number of subcarriers is large. Null switching method removes the need of Channel Side Information (CSI) at the receiver of the OFDM. In spite of some advantages, some problems remain unsolved in null switching. If the Signal to Noise (SNR) ratio is not high, then the Bit Error Rate (BER) is a not enough. Low SNR introduces the incorrect un-switching at receiver side will demote the BER performance.

III. PRACTICAL IMPLEMENTATION

To reduce the computational complexity, we consider the only sub-blocks with largest PAPR. OFDM symbols $\bar{x}$Are partitioned into 'V' disjoint sub blocks

$$\bar{x}^{(v)} \triangleq \left[\bar{x}_0^{(v)} \dots\dots\dots. \bar{x}^{(v)}_{\frac{L}{V-1}}\right] \text{ With } \bar{x}_k^{(v)} = \bar{x}_d \text{ or } 0, 0 \le v \le V-1 \text{ such that}$$

$$\bar{x} = \sum_{v=0}^{V-1} \bar{x}^{(v)}$$

Considering the only sub-blocks with largest PAPR, the number of Shifting possibilities will reduce drastically. Computational complexity is reduced.

The input signal will be modulated using modulator block and then this modulated signal will be given to null data sub-carrier shifting blocks. The shifting block will shift the null and data subcarriers and will find the data subcarriers will are when shifted with a null sub-carriers provides lowest PAPR value. Once the shifted sequence providing lowest PAPR value is found, then PTS method will be applied to further reduce the PAPR value of OFDM system. In this way

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

,shifting and PTS method will be combined to propose a new method to reduce the PAPR value of OFDM system. At receiver side reverse operation will happen.

IV. PROPOSED WORK

The objective is to propose a new algorithm which is a hybrid combination of Partial transmit Sequence [] and Null data subcarriers shifting method [] to reduce the Peak to Average Power Ratio (PAPR) of Orthogonal Frequency Divison Multiplexing (OFDM) with low the computational complexity. The proposed hybrid algorithm will be compatible with the current commercial systems and will be very useful in delay sensitive services.

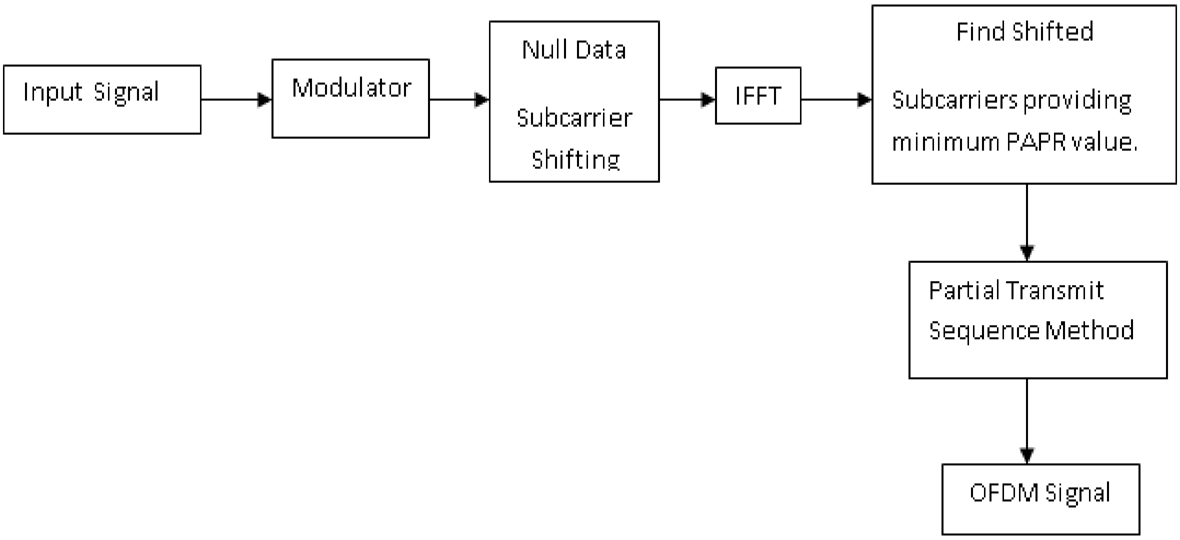


Figure: Block diagram of Transmitter Side

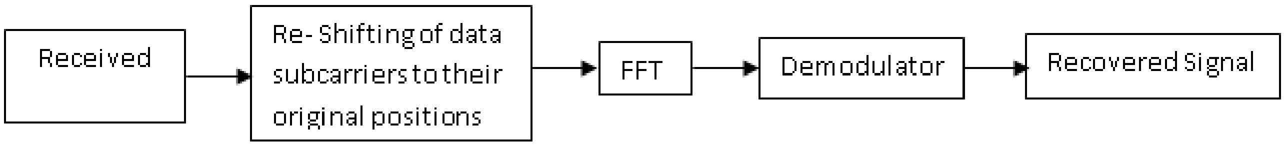


Figure- Block diagram of Receiver Side

A. *Simulations*

For example, IEEE 802.11a.The Simulation is based on the assumption that the spectrum will not be changed after the shifting of null subcarriers. We consider the number of subcarriers in an OFDM systems equals 64 with QPSK data symbols, where L-N=48 is the number of data subcarriers and P is the number of null subcarriers used for PAPR reduction. The 64 subcarriers are divided into 8 sub blocks with 4 times oversampling. In order to generate the complementary Cumulative Distribution Function (CCDF) of the PAPR, 105 OFDM data blocks are generated randomly. The signal block is portioned into V=8 sub blocks and only sub block with the largest PAPR undergoes the proposed shifting scheme.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

B. *Computational Complexity*

Computational Complexity of the null switching method is very large whenever the number of subcarriers is large. Even if computational Complexity is higher, the null switching method doesn't need any channel side information (CSI). Apart from this Bit Error Rate (BER) is not that much enough to get a good amount of PAPR reduction. Due to the low value of Signal to noise (SNR), it's very much difficult to get transmitted signal at the receiver side which reduces the BER performance.
Due Some of the disadvantages of the Null Switching Method, an improved version of null switching method is the null shifting method. Null Switching method improves the BER performance at good extent and reduces the computational complexity.

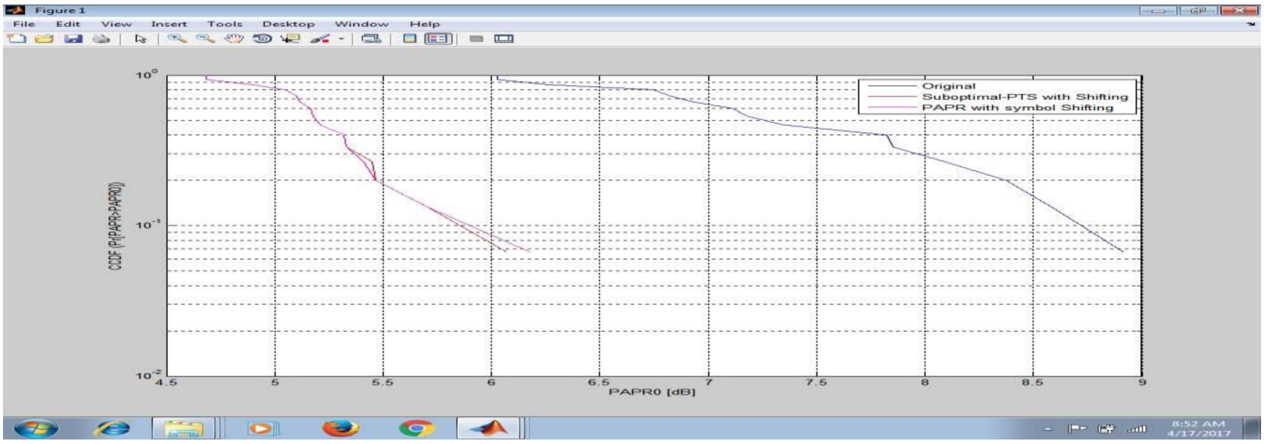
C. *Null Subcarriers*

Unused subcarriers are also known as Null Subcarriers. Unused subcarriers are not transmitting any information. Here unused subcarriers are used as guard band in IEEE 802.11 a/g. Unused subcarriers are used as guard band at High frequency, Mid Frequency and Low frequency end. 6 Unused subcarriers are used as guard band at the low frequency end and 5 Unused subcarriers are used as guard band at the high frequency end.

D. *Channel Side Information (CSI)*

At the receiver side, to recover exact transmitted signal we need to transmit the channel side information bits to receiver. CSI bits reduces the spectrum efficiency because they need a separate channel to transmit the CSI bits.

V. SIMULATION RESULTS



VI. CONCLUSION

The proposed scheme reduces the PAPR of multicarrier transmission by shifting the null subcarriers among the different data sub carriers. This new scheme shifts null subcarriers among the data subcarriers to reduce the PAPR. For the reduction of computational complexity, we applied the proposed scheme to sub blocks with highest PAPR only. This method maintains the computational complexity at low, reduces the PAPR at great extent, require less CSI and compatible with other PAPR reduction methods.

For practical implementation, We developed a simplified method which degrades the computational complexity by applying the simplified method to sub blocks with the highest Peak to Average power ration (PAPR).
Number of shifting operations, reduced drastically by applying the method to the sub blocks with the highest PAPR.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

REFERENCES

1. Bo Wang, Pin-Han Ho, and Chih-Hao Lin, “OFDM PAPR Reduction by Shifting Null Subcarriers Among Data Subcarriers,” IEEE COMMUNICATIONS LETTERS, VOL. 16, NO. 9, SEPTEMBER 2012, pp. 1377–1379.
2. Pooria Varahram, Borhanuddin Mohd Ali, “Fine Partial Transmit Sequence Scheme with New Phase Sequence,” IEEE Transactions on Consumer Electronics, Vol. 57, No. 2, May 2011
3. S Ahmed and M Kawai, “Dyanamic null data subcarrier switching for OFDM PAPR reduction with low computational overhead,” IEEE electronics letter, Vol 48, No 9, 26th April 2012.
4. K.T. Wong, B. Wang and J.-C. Chencole , “OFDM PAPR reduction by switching null subcarriers and data-subcarriers,” IEEE electronics letter, Vol 47, No 1, 1 January 2011.
5. Tao Jiang, Member, IEEE, and Yiyan Wu, Fellow, IEEE, “An Overview: Peak-to-Average Power Ratio Reduction Techniques for OFDM Signals,” IEEE TRANSACTIONS ON BROADCASTING, VOL. 54, NO. 2, JUNE 2008, pp 257-267
6. T. Jiang, W. D. Xiang, P. C. Richardson, J. H. Guo, and G. X. Zhu, “PAPR reduction of OFDM signals using partial transmit sequences with low computational complexity,” *IEEE Trans. Broadcast.*, vol. 53, no. 3, pp. 719–724, Sep. 2007.
7. S. H. Han and J. H. Lee, “An overview of peak-to-average power ratio reduction techniques for multicarrier transmission,” *IEEE Wireless Commun.*, vol. 12, no. 2, pp. 56-65, Apr. 2005.
8. S. H. Han and J. H. Lee, “An overview of peak-to-average power ratio reduction techniques for multicarrier transmission,” IEEE Wireless Commun., pp. 56–65, Apr. 2005.
9. Ramjee Prasad,“OFDM for Wireless Communications Systems”, Universal personal communication.
10. Hermann Rohling, “OFDMConcepts for Future CommunicationSystems”, Springer Heidelberg Dordrecht London New York