ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

PAPR REDUCTION IN MIMO-OFDM TECHNIQUE BY USING ADAPTIVE OF SCALABLE SLM METHOD

[1]P.Ramakrishnan,[2]P.T,.Sivagurunathan

[1,2]Assistant Professor ,[1,2]Dept of ECE

M.Kumarasamy College of Engineering(Autonomous) –Karur,Tamilnadu

Email Id:[1]ramumkce@gmail.com,[2]Siva043@gmail.com

Abstract: *OFDM converts a hasty data channel into a number of parallel, lower-speed channels.The mixture of Multiple input multiple output technology(MIMO) with orthogonal frequency division multiplexing system(OFDM) is identified as MIMO-OFDM system. It is the mainly striking method for elevated data rate communication and a trustworthy technique. The main negative aspect of OFDM system is lofty PAPR .This problem has an effect on multiple antenna transmitters and receivers to raise the power efficiency protection to impulse intrusion. Adaptive PTS system is one of the PAPR reduction procedure in OFDM technology. In the adaptive PTS technique summation of separated data blocks are created from an OFDM data block by a set of phase sequences and selected sequences is transmitted to reduce PAPR. In this document we put forward a scalable PTS technique so that it does not need the exchange of side information between the transmitter and the receiver. Simulation outcome shows the scalable selected mapping technique and 3dB clipping can attain as greater PAPR lessening performance.*

***Index Terms*—Multiple-input multiple-output (MIMO), orthogonal frequency division multiplexing (OFDM), peak-to-average power ratio (PAPR),Partial transmit sequence**

I. INTRODUCTION

Orthogonal frequency division multiplexing is a multicarrier multiple access technique in transferring large no of data blocks. Future mobile system is expected to provide large date rate for multimedia applications. The multipath fading channel is to improve the bandwidth efficiency, at the same time increases systems capacity which provide a reliable transmission [12]. The main principle of OFDM channel is to subdivide the high date rate to many lower rate streams that are to be transmitted simultaneously over a large number of subcarrier channels. One of the major drawbacks of OFDM systems is that the OFDM signal exhibits large Peak to Average Power ratio. Many techniques have been proposed to reduce the high PAPR of OFDM signals such as clipping and filtering ,tone injection ,Active cancellation, tone reservation ,Partial transmit sequence ,selective mapping etc,. Also there are methods based on coding of the transmitted data. [11]

Basic Structure of MIMO System

There exist several communication transmission models as follows:

1. Single-input-and-single-output (SISO) system: It uses an
   Antenna at the transmitter and at the receiver.
2. Single-input-and-multiple-output (SIMO) system: It uses
   one antenna at the transmitter antenna and multiple antennas at the receiver[3].
3. Multiple-input-and-single-output (MISO) system: It has
   multiple antenna at the transmitter and one at the receiver
4. Multiple-input-multiple-output (MIMO) system: It uses
   Many antennas both for transmission and reception.
   Multiple transmitting and receiving antennas will achieve
   antenna diversity without reducing the spectral efficiency.

Clipping is a technique which remove the undesirable noise .filtering is to remove the side lobes but it may generate a large PAPR . High PAPR brings the OFDM signal distortion in the non-linear region of high power amplifier (HPA) and the signal distortion introduce the decrease in bit error rate (BER). However to increase bandwidth of the multicarrier signal in the

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

form of inter modulation technique subcarriers and out-of-band radiation, the transmit power amplifier has to be operated in its gradually increase the particular region [7].If the HPA is not operated in linear region with large power back-offs, it is not possible to keep the out-of band power below the particular threshold value limits. This situation leads to very insufficient amplification and expensive transmitters. Many PAPR reduction technique results in performance degradation in terms of BER as compared to original OFDM signal.

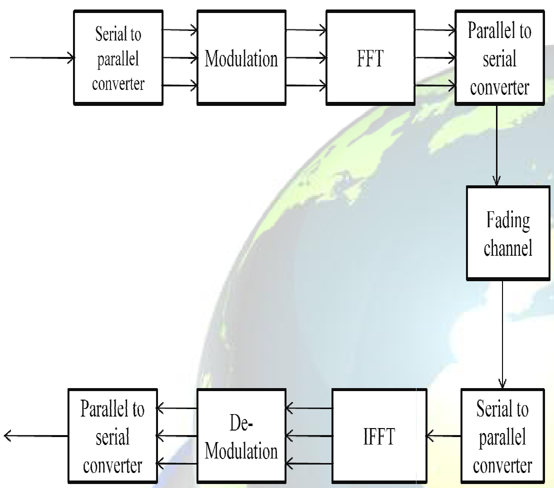

Fig.1 Block diagram of MIMO-OFDM Systems

The input data is sent to the serial to parallel converter that converts high data signal into small block codes.It consists of complete information of entire signal. The data sent by the serial to parallel converter is received by modulator which employs either QPSK or BPSK modulation technique and it send for the IFFT which converts frequency domain signal into time domain signal[15].

Then calculates the peak power and average peak power of each block code and calculate peak-to-average power ratio (PAPR). By comparing all the ratios we select the lowest PAPR and proceed with that signal in order to reduce the effect on their OFDM system.

In high-speed wireless communication, combining MIMO and OFDM technology, OFDM can be applied to transform frequency-selective MIMO channel into parallel flat MIMO channel, reducing the complexity of the receiver, through multipath fading environment can also achieve high data rate robust transmission. Therefore, MIMO-OFDM systems obtain diversity gain and coding gain by space-time coding, at the same time, the OFDM system can be realized with simple structure. Therefore, MIMO-OFDM system has become a welcome proposal for 4G mobile communication systems.

At the transmitting end, a number of transmission antennas are used. An input data bit stream is supplied into space-time coding, then modulated by OFDM and finally fed to antennas for sending out (radiation). At the receiving end, in-coming signals are fed into a signal detector and processed before recovery of the original signal is made. Presently, many companies and research institutions have developed MIMO-OFDM experimental systems. Airbust –production of Iospan Company that first used MIMO and OFDM technology in the physical layer at the same time for wireless communication systems

II. RELEATED WORKS

A lot of survey works has been viewed in PAPR reduction technique in wireless communication technique it is major drawback of the OFDM.

The paper[11] clarifies the Adaptive PTS approaches [11]. This approach is employed to lessen the effects of peak to average power ratio along with the use of selective mapping technique.

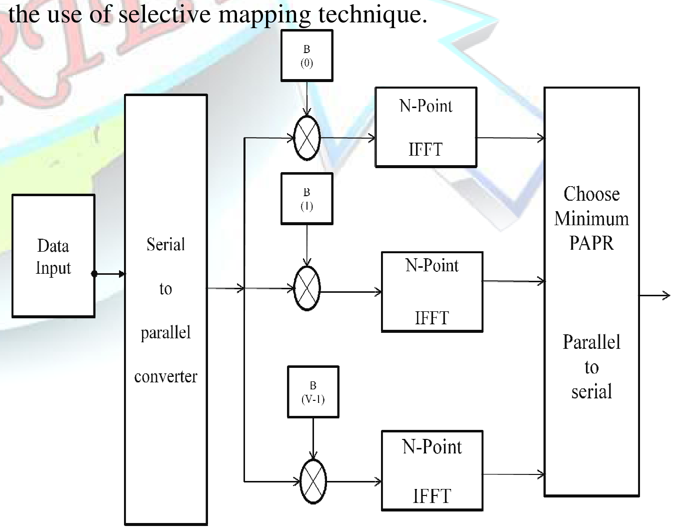

Fig.2 Block diagram of Selected mapping technique

Data blocks are converted into several separate data blocks and the one with lower PAPR is sent in which

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

converting process involves multiplying with data sequences to random phase sequences generated. The selected index is called side-information index (SI Index) and it should be transmitted to allow recovery of the data blocks at the receiver side. SLM result in reduction of data rate. Probability of error SI detection has a significant influence on error performance of the system. In this technique complexity is involved in recovering the side information Moreover, this reduces the data rate of the system because the side information is sent with the data blocks carrying information. Many methods have been proposed to reduce this side information such as Adaptive PTS method described in known phase sequences like chaotic, Hadamard, Riemann and lots of other techniques described in [10] –[12].

A entire set of possibility signal is introduced similarity in the same information in adaptive partial transmit sequence, and then regarding most favorable signal is selected with less PAPR will be transmitted [5]. In this technique input data is multiplied with random symbol. The receiver recovers the original information without any side information as it multiplies with the multiple weights. The advantages of adaptive PTS method is that it diminish the peaks, and can manage the large number of subcarriers.

III. ABOUT PAPR

Presence of large number of independently modulated sub-carriers in an OFDM system makes the peak value of the system will be very high as compared to the average of the whole system. This ratio of the peak to average power value is termed as Peak-to-Average Power Ratio. Coherent addition of N signals of same phase produces a peak which is N times the average signal.[11-12]

$$PAPR = \frac{(mod\ x\ peak)2}{(Xrms)2} \qquad (1)$$

The major disadvantages of high PAPR are:

1. Increased complexity in the analog to digital and digital to analog converter.
2. Reduction in the efficiency of RF amplifiers.

Clipping is a simple technique for PAPR reduction in certain signal introduce both in-band and out of band distortion in orthogonally sub carriers. This technique will peak growth in OFDM signal. It can reduce the clipping and filtering method clipping signal operation the over samples signal to reduce in band distortion. A threshold value of the amplitude is set sub-carrier having amplitude more than that value is clipped or that sub-carrier is filtered to bring out a lower PAPR value. Christo Ananth et al. [8] discussed about Improved Particle Swarm Optimization. The fuzzy filter based on particle swarm optimization is used to remove the high density image impulse noise, which occur during the transmission, data acquisition and processing. The proposed system has a fuzzy filter which has the parallel fuzzy inference mechanism, fuzzy mean process, and a fuzzy composition process. In particular, by using no-reference Q metric, the particle swarm optimization learning is sufficient to optimize the parameter necessitated by the particle swarm optimization based fuzzy filter, therefore the proposed fuzzy filter can cope with particle situation where the assumption of existence of “ground-truth” reference does not hold. The merging of the particle swarm optimization with the fuzzy filter helps to build an auto tuning mechanism for the fuzzy filter without any prior knowledge regarding the noise and the true image. Thus the reference measures are not need for removing the noise and in restoring the image. The final output image (Restored image) confirm that the fuzzy filter based on particle swarm optimization attain the excellent quality of restored images in term of peak signal-to-noise ratio, mean absolute error and mean square error even when the noise rate is above 0.5 and without having any reference measures.

The coding technique is used to select such code words that minimize or reduce the PAPR. It causes no distortion and creates no out-of-band radiation, but it suffers from bandwidth efficiency as the code rate is reduced. It also suffers from complexity to find the best codes and to store large lookup tables for encoding and decoding ,especially for a large number of sub carriers .In coding technique some of the technique are to reduce the PAPR .The different coding techniques are Simple block coding, Complement coding techniques.

Signal Distortion techniques:

Table.1 Comparison of PAPR reduction technique [11]

One of the most pragmatic and easiest approaches is clipping and filtering which can snip the signal at the transmitter so as to eliminate the appearance of high peaks above a certain level. Clipping can be implemented to the discrete samples prior to digital-to-analog-convertor (DAC) or by designing analog-to-

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

Types	Reduced Data rate	Increased Transmit power	Boosted BER	Distortion less
Clipping & Filtering	×	×	×	×
Coding	√	×	×	√
Tone Reservation	√	√	×	√
Tone Injection	√	√	√	√
Interleaving	×	√	×	√
Selected Mapping	√	×	√	√
Partial Transmit Sequences	√	×	√	√

digital-convertor (DAC) and/or amplifier with saturation levels which are lower than the dynamic range [17]. But due to the nonlinear distortion introduced by this process, orthogonality will be destroyed to some extent which results in serious in-band-noise and out-of-band noise. In-band noise cannot be removed by filtering, it decreases the bit error rate (BER). Out-of- band noise reduces the bandwidth efficiency but frequency domain filtering can be employed to minimize the out-of-band power. Although filtering has a good effect on noise suppression, it may cause peak re-growth. To overcome this drawback, the whole process is repeated several times until a desired situation is achieved. Furthermore, some other novel proposals which combine this method with coding and/or signal scrambling have already been studied by other researcher.

Signal Scrambling Techniques:

The fundamental principle of this technique is to scramble each OFDM signal with different scrambling sequences and select one which has the smallest PAPR value for transmission. Apparently, this technique does not guarantee reduction of PAPR value below to a certain threshold, but it can reduce the appearance probability of high PAPR to a great extent[11]. This type of approach include: Selective Mapping and Partial Transmit Sequences (PTS). SLM method applies scrambling rotation to all sub-carriers independently while PTS method only takes scrambling to part of the sub-carriers. These two methods can be 28 applied to any scenarios without restriction on the number of sub-carriers and type of modulation. However, for successful recovery of the signal at the receiver, additional information is needed. That leads to low bandwidth utilization and high hardware complexity for implementation [12].

Partial Transmit Sequence:

In the Partial Transmit Sequence (PTS) technique, an input data block of N Symbols is partitioned into disjoint sub blocks. The sub-carriers in each sub-block are weighted by a phase factor for that sub-block. The phase factors are selected such that the PAPR of the combined signal is minimized. But by using this technique there will be data rate loss [4]

IV. PROPOSED WORK

Each OFDM frame is mapped to a number of U independent candidate sequences. Out of which the signal with lowest PAPR is selected. These independent candidate sequences can be generated by multiplying carrier wise the initial OFDM frame X by U phase vectors, P(u) is defined as [P1(u), P2(u), . . ., PN(u)], u = 1, 2, . . . , U. Let P(u) = exp(jÞ) and Þ is chosen from {0, $\pi/2$, π, 3 $\pi/2$}. The independent candidates are transformed to time domain by x(u) = IDFT{X Θ P(u)}, where Θ denotes element wise multiplication, and their corresponding PAPRs are calculated. The minimum PAPR value OFDM frame x(u) is selected as best OFDM frame and it is transmitted. To recover the original frames at the receiver, the 'side information' frames are required to indicate the vector P(u) which have to be communicated to the receiver. In the MIMO configuration, the selected mapping is applied to each of the Mt antennas. All Mt OFDM frames are simultaneously modified with the same phase vector Pμ(u) = P(u) for all μ = 1, 2, . . . , Mt.

Altering of phase adaptively and choosing the signals amongst the IDFT, IDCT and IDST techniques is the chief idea of this approach in order to obtain the reduced PAPR. In this approach we are employing adaptive algorithm with maximum number of phase sequence equals 16 phases. The foremost steps of this technique are delibrated below:

In this Adaptive PTS technique, the input data structure is multiplied by random phase series. Unlike the conventional Adaptive PTS scheme, the proposed scheme selects among IDFT, IDCT and IDST to get the lowest PAPR. Moreover, the

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

multiplied phases are changed adaptively if the PAPR is higher than pre-determined value. Finally, the transmitter sent the data block, which have minimum PAPR.The proposed scheme is characterized as follows: first we design the destination PAPR value (threshold PAPR). Second, detachment the data into blocks (X) and generates four phases and each data block is multiplied by a phase groupings (B1, B2, B3, B4). Third, calculate the IDFT, IDCT and IDST for every block (Z1, Z2, Z3, Z4). Fourth, measure PAPR for each block, select the lowest PAPR and correlate it with threshold PAPR. If the PAPR is lower than or equal than threshold PAPR, then the transmitter send the data block, which have minimum PAPR. Otherwise, change the phase groupings (B1, B2, B3, B4) and again do the precedent steps for each data block. The maximum digit of phase sequences is 16 phases. So we get the intention PAPR with 4 phases or higher phases with maximum 16 phases.

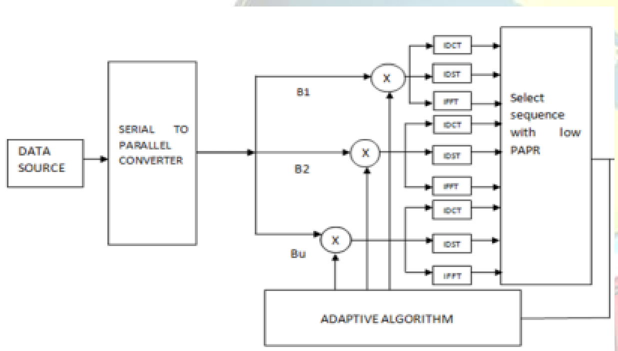

Fig.3. shows the block diagram for the proposed scheme

V. RESULTS

The simulations consequences showed in this paper obtained by using MATLAB software to approximate the PAPR reduction competence with our new. In this simulation, compared the results of the proposed design with that of the QPSK intonation with different types of client like 64,128,256.Beter outcome papr reduction by using the Adaptive PTS techniques. In main focus to reduce the Peak to average power ratio by using Adaptive PTS technique and in the Quadrature Phase Shift Keying technique's

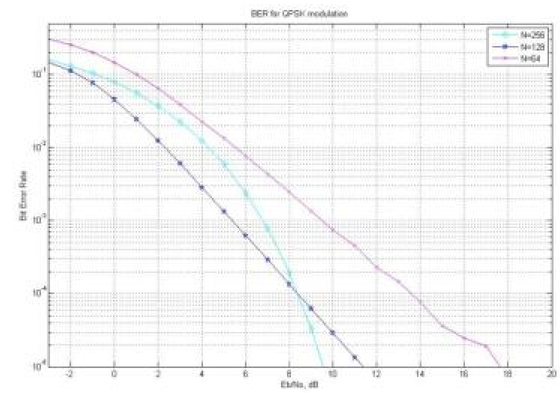

Fig.1 .PAPR reduction by using Adaptive PTS technique in QPSK modulation

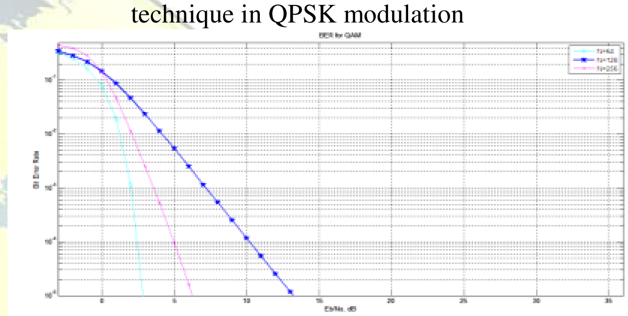

Fig.2 .PAPR reduction by using Adaptive PTS technique in QAM modulation

In the above graph representation of Adaptive PTS technique no of sub carriers 64,128,256.It can be contemplate the different types of sub carriers. In main focus to reduce the Peak to average power ratio via Adaptive PTS technique and Quadrature amplitude modulation technique's. simulation results, in case of N=256 at clipping probability of 10-3,the PAPR reduction of 1.7 dB is accomplished by the proposal scheme disunioned to Adaptive PTS based ofdm system with conventional OFDM ,and the PAPR reduction of 4.4 dB is accomplished by the proposed scheme compared to conventional OFDM system.

As the PAPR depends on the number of carriers, we present another example for the PAPR assessment in Fig. 5, where the number of carriers equals 512. From this figure, we can see that, the PAPR reduction of 1.7 dB is achieved by using Adaptive PTS based OFDM compared to conventional OFDM. While we PAPR gain of 4 dBs is achieved by using the proposed scheme correlate to the conventional OFDM, at clipping probability of 10-3.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

To show the efficiency of using hybrid basis function rather than single basis function, the probability of obtaining the lowest PAPR for each of the basis functions is shown in Fig. 6. From this figure, we can see that none of these functions can give the lowest PAPR for all blocks.
assessment of signal to noise ratio and bit error rate. in this method we have to represent the graphical methods whenever we have to increase the bit error rate at the same time signal to noise ratio also decreases.

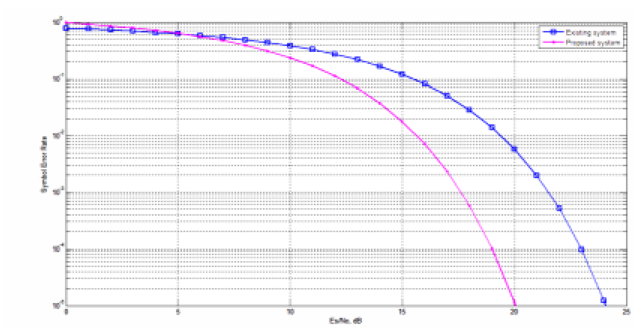

Fig.3. Comparison of BER and SNR

No of Subcarriers	PAPR in dB		BER
	Existing Method	Proposed Method	
64	3.5	2.5	***
128	4.1	2	10^-3
256	4.4	1.7	10^-2
512	4	1.7	10^-1

VI.CONCLUSION

In this paper, we proposed a PAPR reduction scheme that depends on Adaptive PTS with scalable phase. The proposed scheme adaptively selects among IDFT-based OFDM and adaptively change phase to get the lowest PAPR. The proposed scheme achieved PAPR reduction up to 4 dBs in case of 512 sub-carriers at clipping probability of 10-3 contemptate to conventional Adaptive PTS technique.

VI. REFERENCES

[1] M. F. Naeiny and F. Marvasti. "Selected mapping algorithm for PAPR reduction of space-frequency coded OFDM systems without side information," IEEE Trans. On Vehicular Technology, vol. 60, no. 3 ,March 2011.
[2] L. Yang, R. S. Chen, Y. M. Siu, and K. K. Soo ,"PAPR reduction of an OFDM signal By use of PTS With low computational Complexity," IEEE Transaction on Broadcasting, Vol. 52, No. 1, March 2006.
[3] S. H. Muller, R. W. B¨auml, R. F. H. Fisher and J. B. Huber, "OFDM With Reduced peak-to-average power Ratio by Multiple signals. Representation," *Annals of Telecommunications*, vol. 52, Feb. 1997.
[4] R.Gayathri, V.Sangeetha, S.Prabha, .Meenakshi, N.R.Raajan," PAPR Reduction in OFDM Using Partial Transmit Sequence (PTS)", International Journal of Engineering and Technology (IJET)
[5] Research Article"Partial Transmi Sequences for Peak-to- Average Power atio Reduction in Multiantenna OFDM" EURASIP Journal on Wireless Communications and Networking Volume 2008, Article ID 325829P.
[6] Kokil Dhiman, Tarun Gulati," PAPR Reduction in OFDM Systems" International Journal of Engineering Research & Technology (IJERT)Vol. 1 Issu e 6, August – 2012
[7] Dr.P.Malathi, Dr.P.T.Vanathi" Peak to Average Power Ratio (PAPR) Reduction Techniques for OFDM-MIMO System"Peak to Average Power Ratio (PAPR) Reduction Techniques for OFDM-MIMO System.
[8] Christo Ananth, Vivek.T, Selvakumar.S., Sakthi Kannan.S., Sankara Narayanan.D, "Impulse Noise Removal using Improved Particle Swarm Optimization", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume 3, Issue 4, April 2014,pp 366-370
[9] Sen-Hung Wang, Student Member, IEEE, And Chih-Peng Li "A Low-Complexity PAPR Reduction Scheme for SFBC MIMO-OFDM SYSTEMS" IEEE signal Processing Letters, vol.16,no. 11, November 2009
[10] Heung-Gyoon Ryu and Kyoung-Jae Youn "A New PAPR reduction Scheme: SPW sub block phase Weighting"seunghe Than,"an overview of peak- to-average power ratio reduction techniques for multicarrier transmission"
[11] Malhar Chauhan, Saurabh patel, Hardik patel "Different Techniques to Reduce the PAPR in OFDM System "International Journal of Engineering Research and Applications

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 1, February 2017

(IJERA),Vol.2, Issue 3, May- Jun 2012, pp.1292-1294

[12] Seung hee han, Stanford university jae hong lee, Seoul national university "an overview of peak-to-average power ratio reduction techniques for multicarrier transmission" ieee wireless communications april 2005

[13] Hyunseuk Yoo, Associate Member, IEEE Frederic Guilloud, Member, IEEE,and Ramesh Pyndiah "Low Complexity Partial Selected Mapping for PAPR Reduction of OFDM System" " ieee wireless communications april 2005

[14] Jung-Chieh Chen*, Member, IEEE* "Partial Transmit Sequences for Peak-to-Average Power Ratio Reduction of OFDM Signals With the Cross-Entropy Method*"* IEEE SIGNAL PROCESSING LETTERS, VOL. 16, NO. 6, JUNE 2009

[15] Honglei Zhang, *Student Member, IEEE,* and Dennis L. Goeckel, *Senior Member, IEEE"* Peak Power Reduction in Closed-Loop MIMO-OFDM Systems via Mode Reservation*"* IEEE COMMUNICATIONS LETTERS, VOL. 11, NO. 7, JULY 2007

[16] *Christian Siegl and Robert F.H. Fischer"* COMPARISON OF PARTIAL Transmit Sequences And Selected Mapping For Peak-To-Average Power Ratio Reduction In MIMO OFDM*"*

[17] K.Sathananthan and C. Tellambura "Reducing Intercarrier Interference in OFDM Systems by Partial Transmit Sequence and Selected Mapping" IEEE wireless communications.

[18] P.Ramakrishnan,P.T.Sivagurunathan"MIMO-OFDM Wireless Communications Reduce The PAPR Technique", International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) vol. 3, Special Issue 7, January 2016".

[19] P.Ramakrishnan,"Survey Paper on PAPR Reduction in MIMO-OFDM Systems "International Journal of Applied Engineering Research (IJAER) Vol.10 Special issue.20 March 2015(Annexure II).

[20] P.Ramakrishnan,P.T.Sivagurunathan,"Reduce the Peak Power in wireless System "Journal of Advances in chemistry(JAC) (Annexure I) Volume 12 Number14 Nov 2016

[21] S.Sivaranjani, P.T.Sivagururnathan, P.Ramakrishnan,"A Framework For Conserving Power In MANETS "Journal of Advances in chemistry(JAC) (Annexure I) Volume 12 Number14 Nov 2016

[22] S.Palanivel Rajan, "Review and Investigations on Future Research Directions of Mobile Based Tele care System for Cardiac Surveillance", Journal of Applied Research and Technology, Vol.13, Issue 4, pp.454-460, 2015.

[23] A.Sridevi, G.K.D.Prasanna venkatesan, "A Survey of PAPR Reduction in OFDM Signals", Journal of Advances in Chemistry, Vol.12, Issue 23, pp.5478-5483, 2016.

[24] V.Kavitha, C.Veeralakshmi, "Surveillance on Many casting Over Optical Burst Switching Networks under Secure Sparse Regeneration", Journal of Electronics and Communication Engineering, Vol. 4, Issue 6, pp.1-8, 2013.

[25] R.Renuka, V.Kavitha, "A Performance Analysis of Load Balanced Deflection Routing with Priority Scheduling in OBS Networks", International Journal of Engineering, Science and Technology, Vol. 5, Issue 4, pp.7-13, 2013.

[26] V.Kavitha, V.Palanisamy, "A Survey of Deflection Routing Techniques in Optical Burst Switching Networks", Archives Des Sciences, Vol. 66, Issue 3, pp.704-712, 2013.