ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Modified SFBC Technique for PAPR Reduction in OFDM Systems Using Alternative Signal Method




Pokala Venkateswara Rao
Vidya Vikas Institute of Technology.

Harsha Vardhan Velagapudi
Vidya Vikas Institute of Technology.

Anil Sooram
Vidya Vikas Institute of Technology.

Dr.J.Sasi Kiran
Vidya Vikas Institute of Technology.

ABSTRACT:

Increased knowledge rates and irresponsibleness square measure the 2 key factors needed to support rising multimedia system applications and new communications technologies. The 2 techniques utilized in high rate transmission square measure orthogonal frequency division multiplexing (OFDM) and multiple-input multiple-output (MIMO) theme. The OFDM is employed to mitigate the matter of lay to rest image interference (ISI) and provides smart protection against co-channel interference and noise. MIMO system helps to scale back attenuation and may be used for decreasing bit error rate that's spatial diversity or to extend the info rate that's spatial multiplexing. The mix of MIMO and OFDM is MIMO OFDM system. One amongst the most important drawbacks of in MIMO-OFDM systems is that the transmitted signal exhibits a high PAPR once the input sequences square measure related to. During this paper, ASM schemes are wont to scale back peak to average power quantitative relation (PAPR) in multiple input multiple output orthogonal frequency division multiplexing (MIMO OFDM) system with area frequency block committal to writing (SFBC). The ASM theme reduces the procedure quality and once ASM theme is employed with construction modulation (QAM). Simulation and results show that the ASM theme reduces PAPR a lot of expeditiously than the ASM theme.

I.INTRODUCTION:

The basic plan of multicarrier modulation is to divide the transmitted bit stream into many alternative sub streams and send these over many alternative sub channels. Usually the sub channels area unit orthogonal below ideal propagation conditions, within which case multicarrier modulation is usually spoken as orthogonal frequency division multiplexing (OFDM).

The info rate on every of the sub channels is far but the overall rate, and therefore the corresponding sub channel information measure is far but the total system information measure. The amount of sub streams is chosen to insure that every sub channel contains a band dimension but the coherence information measure of the channel, that the sub channels expertise comparatively flat weakening. Thus, the Inter-Services Intelligence on every sub channel is tiny. Moreover, within the distinct implementation of OFDM, usually known as distinct multi tone (DMT), the Inter-Services Intelligence is utterly eliminated through the employment of a cyclic prefix. The sub channels in OFDM needn't be contiguous, thus an outsized continuous block of spectrum isn't required for the prime rate multicarrier communications.

Recently, numerous algorithms of the PAPR reduction are projected for single-input single-output (SISO) OFDM systems within the literature, as well as clipping, nonlinear commanding rework, committal to writing technique, selected mapping (SLM), and go lay sequence and therefore the coefficient issue estimation methodology. However, once these ways area unit used on to scale back the PAPR in MIMO-OFDM systems, it ends up in increasing of the complexness and redundancy with the increasing range of antennas. Therefore, many new schemes are projected specially for MIMO-OFDM systems, like the tactic of the poly-phase interleaving and inversion (PII). The simplest advantage of each the ASM and PII schemes is that they may give an honest PAPR reduction while not signal distortion.

However, the procedure complexness of the ASM and PII schemes is extremely high as a result of they have to implement some further inverse distinct Fourier rework (IDFT) operations and iterations of part improvement. Obviously, the procedure complexness of the theme projected in is reduced, that is at the price of losing PAPR reduction.

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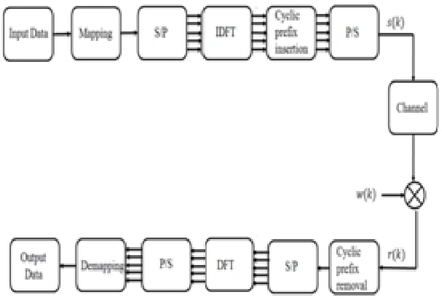

Figure1:-OFDM Block Diagram

Moreover, its optimum part rotation vectors conjointly ought to be transmitted as aspect info to the receiver, leading to loss of the info rate. During this paper, we have a tendency to propose partial transmit sequences (PTS) theme to cut back the PAPR of MIMO-OFDM signals. For convenience and ease, the area time block committal to writing (STBC) is used in MIMO-OFDM systems during this paper. For the projected ASM methodology, original information sequences at 2 antennas area unit partitioned off into many pairs of sub blocks, and every combine of sub blocks multiplies by various factors to come up with completely different combine of sub blocks. Then, the obtained new sub blocks area unit combined to come up with ASM, that keep the structure and therefore the diversity capability of the SFBC. Finally, the combine of other sequences with the tiniest PAPR is chosen to be transmitted. Obviously, the factors of the chosen combine of sequences need to be transmitted as aspect info. However, if the factors area unit chosen significantly, the reworked combine of the constellation points corresponds to just one combine of original constellation points. As a result, the received combine of the constellation points might confirm its corresponding original information while not aspect info at the receiver. Simulation results show that the projected ASM theme might give sensible PAPR reduction, and therefore the ASM-SFBC methodology while not aspect info might give constant bit error rate (BER) performance as that of the ASM theme with MIMO-OFDM with 4-QAM and 16-QAM, severally.

II.PEAK-TO-AVERAGE POWER RATIO IN OFDM SYSTEM:

It is outlined because the giant variation or magnitude relation between the typical signals power and therefore the most or minimum signal power in theory, giant peaks in OFDM system is expressed as Peak-to Average Power magnitude relation (PAPR) and it's sometimes outlined as

$$\mathrm{PAPR} = \frac{P_{\mathrm{Peak}}}{P_{\mathrm{Average}}} = 10\log_{10}\frac{\max\,[|x_n|^2]}{E|x[n]|^2}$$

Where P peak represents peak output power, P average means that average output power [E]. Denotes the mean value, represents the transmitted OFDM signals that area unit obtained by taking IFFT operation on modulated input symbols. Mathematical, is expressed as

$$x_n = \frac{1}{\sqrt{N}}\sum_{k=0}^{N-1} X_k\ W_N^{nk}$$

For associate degree OFDM system with sub-carriers, the height power of received signals is N times the typical power once part values area unit constant. The PAPR of baseband signal [2] can reach its theoretical most at PAPR (db) =10logN. Another usually used parameter is that the Crest issue (CF), that is outlined because the magnitude relation between most amplitude of OFDM signal x (t) and root-mean-square (RMS) of the wave. during this MIMO OFDM system, SFBC codes area unit used as a channel committal to writing technique to try and do error correction and detection and ASM/ASM theme is used to cut back PAPR. The input bits area unit given to modulator wherever modulation of input bits takes ASM victimisation M-QAM advanced constellation. The modulated signal is given by:

Sm (t) =Am g (t) Cos (2πfct)-As g (t) Sin (2πfct)

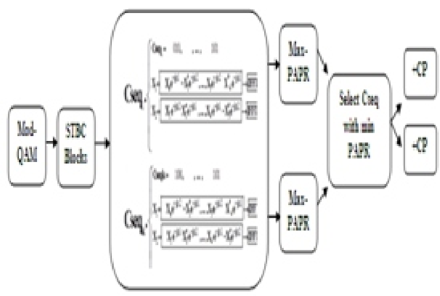

Figure2:-SFBC Based ASM Process in MIMO OFDM

Am and As area unit info bearing signal amplitudes of construction carriers and g (t) is that the input-signal pulse. M-QAM modulated symbols area unit tried and true the STBC encoder and complicated matrix Z is generated specified symbols area unit coded through ASM and time. So, replicas of modulated symbols for block committal to writing area unit sent through 2 transmit antennas and over 2 time slots.The encoded sequence can be found by

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International Journal & Magazine of Engineering, Technology, Management and Research
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Max (z (n))=sum(max(z(n)));
Zn_r=real (Z (n));
Zn_i=imaginary (Z (n));

The encoded bits area is unit given to the OFDM modulator, wherever the bits area unit mapped with the orthogonal carriers. Associate degree inverse FFT is computed on every set of symbols, giving a group of advanced time-domain samples.

$$z(n) = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} Z(k)\, e^{\frac{j2\pi nk}{N}}$$

After OFDM modulation, ASM or ASM theme is applied to cut back PAPR. Finally, the signal with minimum PAPR is transmitted through its various antennas.

III.RESULT ANALYSIS

PAPR of MIMO-OFDM system is defined by

$$PAPR\left(z(n)\right) = \frac{max\{|z(n)|^2\}}{E\{|z(n)|^2\}}$$

Where E {.} is the mathematical expectation.
Complementary additive density performs (CCDF) for PAPR is given by:

$$CCDF\left(PAPR(z(n))\right) = P_r\left(PAPR(z(n)) > PAPR_0\right)$$

ASM Scheme

The ASM theme is when STBC encoder, the coded knowledge is divided into sub blocks, and IFFT operation is performed on every sub block wherever the frequency domain signals area unit born-again into time domain signals. Finally, ASM theme is enforced, within which 2 inputs area unit given to the ASM block one input is from IFFT block and another input to ASM block is that the conjugate of the output of the IFFT block.Suppose the output of the IFFT block is Y (m); [m=0, 1, 2 ...m-1], then the two inputs to the ASM block will be t1and t2where, t2=t1* ASM theme can generate new sequences that area unit given by

T1'= [a (t1) c] ^m+ [bt2] ^m
T2'= [a (t2) c] ^m- [bt1] ^m

Where a^m and b^m are positive integers with a^m ≠ 0 c^m and 1 and 2 respectively. Then the alternate transmitted signals are given by:

$$t_i = \sum_{m=0}^{M-1} t_i^m$$

Where i =1, 2, 3....

Finally, the signal with the bottom PAPR is chosen for transmission.

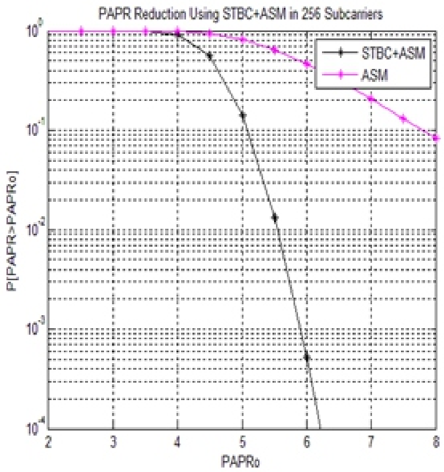

Figure3:-PAPR Reduction using SFBC+ASM in 256 Subcarriers

ASM with SFBC Scheme:

ASM primarily based area unit accrued with a complete transmit power constraint over additive white mathematician noise (AWGN) channel. Moreover, we have a tendency to derive the quantitative relations between PAPR reductions mistreatment SFBC (Space Frequency Block Coding). So as to eliminate the over head individual to facet data regarding the sequence of pre-coders used, we have a tendency to propose the utilization of pre-coded pilots.Key plan of the projected theme is keeping the advantage of the SFBC structure to get some ASMs via combining the signals at completely different transmit antennas. Specifically, once the projected theme is used in SFBC MIMO OFDM systems with Quadrature-amplitude modulation (QAM),

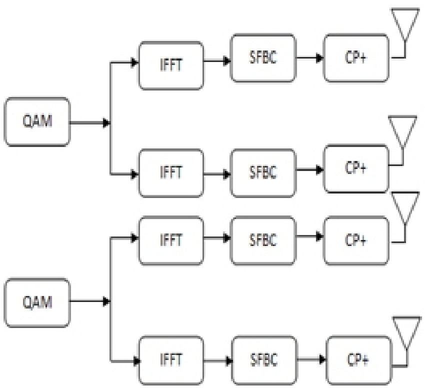

Figure4:- SFBC Block Diagram

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For convenience and ease, the ASM–frequency block cryptography (SFBC) is used in MIMO-OFDM systems during this project original knowledge sequences at 2 antennas area unit divided into many pairs of sub blocks, and every combine of sub blocks multiplies by different factors to get different combine of sub blocks.

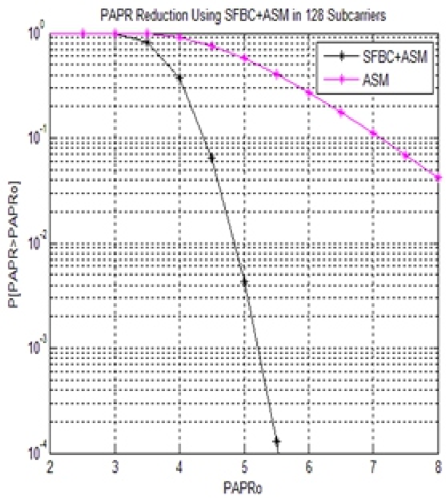

Figure5:-PAPR Reduction using SFBC+ASM in 128 Subcarriers

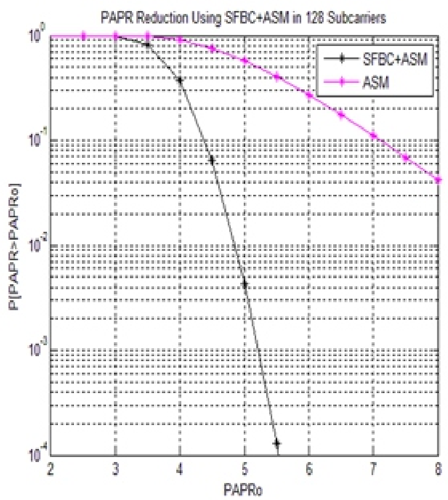

Figure6:-PAPR Reduction using SFBC+ASM in 64 Subcarriers

ASM Scheme:

The Active Constellation Extension (ASM) is a horny technique as a result of sensible PAPR reduction performance and no restriction to the amount of subcarriers [13]. It may be aforementioned that ASM technique could be a changed technique of ASM. ASM technique works higher than ASM technique.

The most advantage of this theme is that there's no got to send any facet data to the receiver of the system, when, differential modulation is applied all told sub blocks. During this theme, the approaching input bits area unit divided into smaller disjoint sub blocks. Input from every divided sub block born-again from frequency domain to time domain by mistreatment N-point inverse quick Fourier remodel (IFFT). The time domain sequences area unit increased by rotating part factors Z= [Z1, Z2, Z3...Zm] ^T, to attenuate PAPR then these sequences area unit then more to make the OFDM image for transmission.The ensuing time domain signal,

$$x'(z) = \sum_{m=1}^{M} z_m . x_m$$

Allowable phase factor,

$$z_m = e^{j\Phi_m}$$

Xm is the time domain sequence and Øm can take the value between (0, 2π).

Table:-Comparison between ASM and SFBC with ASM

Method	Base Paper	Modification
	ASM	SFBC+ASM
QAM-256	8.7	6.25
QAM-128	8.5	5.45
QAM-64	8.1	4.85

The main aim of this theme is to style Associate in nursing best part issue for every sub block set that minimizes the PAPR. Finally, the signal with the bottom PAPR is chosen for transmission.

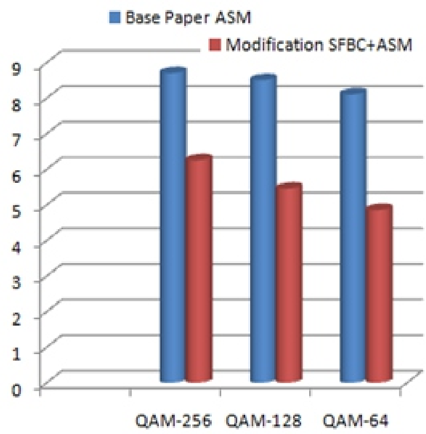

Figure7: Bar Graph for ASM and SFBC+ASM

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IV.CONCLUSION:

In this paper, we have a tendency to investigated associate economical PAPR reduction technique dedicated to MIMO-OFDM systems mistreatment SFBC codebook. The most feature of our planned methodology is that it induces associate embedded signalling through the advanced precoders codebook that results in a strong recovery of the transmitted signal and guarantees an awfully low failure call rate. To any improve the choice method, we have a tendency to plan a further embedded signal that consists of a group of turned and un-rotated QAM constellations and once utilized in the call method (using a tough decision deduced from a Max-Log-MAP decoding), it considerably improves the MIMO-OFDM system performances in terms of CCDF of the PAPR, SIER and BER. This call criterion ensures an honest call performance once absolutely the LLR price is larger than a precise threshold. However once it's near zero (for terribly low SNR values), the choice will be biased. To beat this issue, conceiving a soft call method would be associate acceptable solution: this can be a research facet that we have a tendency to area unit presently work.

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Author's Details:

P.Venkateswara Rao Graduated in B.Tech ECE in 2012 from JNTU Hyderabad. He is currently pursuing Masters Degree in M.Tech [WMC] from JNTUH University, Hyderabad, R.R. Dist Telangana State,India.

Harshavardhan Velagapudi working as Assistant Professor in ECE Dept. in Farah Institute of Technology, Chevella, R.R. Dist Telangana State, India. Post Graduated in ECE (Embedded Systems) M.Tech. from VIGNAN'S UNIVERSITY, Vadlamudi, Guntur, A.P .

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
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He Graduated in ECE B.Tech. from JNTU kakinada. His research interests include Wireless Communications, Embedded Systems. He has published 1 research papers in International Conferences, Journals.

Anil Sooram Graduated in B.Tech ECE in 2007 from JNTU Hyd. He received Masters Degree in M.Tech [ECE] from JNTUH University, Hyderabad. Presently he is working as Associate Professor in ECE Dept. in Farah Institute of Technology, Chevella, R.R. Dist Telangana State, India. His research interests include Wireless Communications, Embedded Systems. He has published 3 research papers in International Conferences, Journals. He has received best Teacher award from Farah Group.

Dr. J. Sasi Kiran Graduated in B.Tech [EIE] from JNTU Hyd. He received Masters Degree in M.Tech [Computers & Communications] from Bharath University, Chennai, M.Tech [CSE] from JNT University, Hyderabad. He received Ph.D degree in Computer Science from University of Mysore, Mysore. He has served Vidya Vikas Institute of Technology for 10 years as Assistant Professor, Associate Professor, HOD-CSE&IT & Vice Principal and taught courses for B.Tech and M.Tech Students. At Present he is working as Professor in CSE and Dean – Academics in Vidya Vikas Institute of Technology, Chevella, Greater Hyderabad, R.R. Dist Telangana State, India. His research interests include Image Processing, Cloud Computing and Network Security. He has published several research papers till now in various National, International Conferences, Proceedings and Journals. He is a life member of CSI, ACM, ISTE, IE, IAE, NSC, ISCA, IACSIT, CSTA, AIRCC, CRSI, GMIS-USA, Red Cross and Managing Committee Member of Computer Society of India. He has an editorial board member of IJERT and Board of Studies Member of CVSR Engineering College, Hyd. He has received Best Teacher award twice from Vidya Group, Significant Contribution award from Computer Society of India and Passionate Researcher Trophy from Sri. Ramanujan Research Forum, GIET, Rajuhmundry, A.P, India.