A Review on PAPR Reduction in Perspective of BER Performance in MIMO-OFDM Based Next Generation Wireless Systems.

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Abstract*: Today, high speed and trustworthy wireless communication over mobile is the requirement of society. As the mobile applications and the users are rapidly increasing, it is obligatory to have more reliable, high speed wireless network with high throughput, which will combat the disadvantages in existing system in this multiuser environment. In wireless system the received signal may be corrupted due to noise and interferences such as 'inter symbol interference' and 'inter carrier interference' when subjected to multi-path fading. Also the performance of the system may be affected due to poor 'bit error rate' and high 'peak to average power ratio' value, which further affect the signal power and spectral efficiency of transmitted signal. The blend of 'orthogonal frequency division multiplexing' and 'multi input multi output' antenna system referred as MIMO-OFDM system, which offers the improvement in quality of service and higher throughput to satisfy the tomorrow's need. This review article mainly focuses on various technologies adopted by different researchers for enhancing the 'bit error rates', 'peak to average power ratio', 'signal to noise ratio' and 'spectral efficiency' performances in wireless systems. We continue by highlighting the limitations and comparing results of conventional methods, schemes and algorithms proposed by different researchers. We also focus on the multiple antenna system (MIMO), which is designed for future multiuser environment to enhance the capacity or to have high throughput along with good quality services.

***Keywords*: 5G, Wireless, Antenna, Interference, Multicarrier, modulation, MIMO, OFDM, PAPR, BER.**

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I. Introduction

In this modern era, the digital communications over wireless link have made remarkable development that connects entire world with ultra high speed digital communication. Today mobile users, applications, and protocols are rapidly changing, and the world is switching towards next generation 5G technologies [1, 2]. This switching to new generation faces many challenges as it deals with different wireless communication standards such as IEEE 802.11a, IEEE 802.16a, and protocol at same time. The primary objective of the next generation communication system is to reduce the system complexity due to involvement of different technologies and algorithms, to reduce the power, to utilize available bandwidth optimally and to provide errorless reliable high-speed wireless communication. To combat with various challenges in wireless link, an integration of MIMO (Multi-Input-Multi-Output) and OFDM (Orthogonal-Frequency-Division-Multiplexing) technology is playing key role in next generation system [3]. The MIMO-OFDM system combats frequency selective fading and avoids the application of complex equalizers. It is an endowed technology for reliable communication systems providing good spectral efficiency [4]. The MIMO-OFDM schemes take advantage of spatial diversity to provide exceptionally high capacity, throughput, and robustness against ISI (Inter-Symbol-Interference)[5]. The MIMO-OFDM has been adopted in several standards like Wi-Fi (wireless Fidelity), LTE (Long-Term-Evolution), LTE Advance or 3GPP (Third-Generation- Partnership-Project), Wi-MAX (Worldwide-Interoperability for Microwave-Access) / IEEE 802.16m, WLAN (Wireless-Local Area-Network) / IEEE802.11n [3, 6]. However, in multipath fading environment the MIMO-OFDM wireless systems are susceptible to different types of error rates like BER (Bit- error-rate), SER (symbol-error-rate), and FER (Framing- error-rate), Interferences like ISI, ICI (Inter-carrier- interference) and High PAPR (Peak to Average-

Power- Ratio). In AWGN (additive white Gaussian noise) error rates can be improved up to 10^{-3} at 1 to 2 dB higher SNR using different constellation techniques and coding. Whereas in the multipath fading environment to improve the error rates up to 10^{-3}, the SNR to be increased up to 10 dB. Therefore it is obligatory to fight with the multipath fading effects in wireless communication system [7]. This review article focuses specifically on the error performance analysis and PAPR reduction schemes in MIMO-OFDM system, investigated by different researchers.

This paper is planned under following heads. Section-II, describes the basic MIMO-OFDM system model. Section-III, endow with brief review on enhancement of BER performance in MIMO-OFDM system. Section-IV, presents review on different methods of PAPR reduction. Section-V, presents expected result and finally section-VI, concludes the article.

II. SYSTEM MODEL

MIMO-OFDM is an efficient technology for reliable wireless systems providing spatial diversity, high spectral efficiency, capacity and throughput while providing robustness against various impairments [5].

A. *MIMO Antenna system.*

It has been shown that the capacity of MIMO linearly increases with minimum number of transmit (M_t) and receive (M_r) antennas [3]. Due to spatial diversity offered by MIMO, the SE (spectral efficiency) can be effectively improved. Implementing additional antennas at receiver or transmitter could be successful way for maximizing the received power. A MIMO antenna system with ($M_t \times M_r$) antenna configuration is shown in figure 1. The MIMO antenna system with multiple antennas at transmitter and receiver section offer spatial diversity that further improves the QoS (Quality of service) and throughput of the system [6]. However, the advantages the MIMO antenna systems are restricted partly due to inter-channel interference (ICI), transmit power requirement and the complexity of implementation [8].

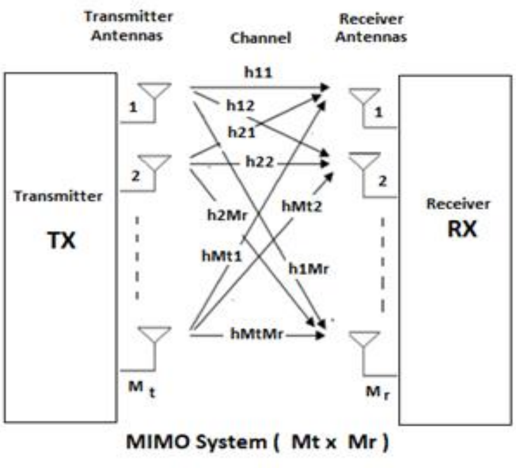

Fig. 1. MIMO ($M_t \times M_r$) antenna System

B. *OFDM System.*

The OFDM system translate frequency selective fading channels in to several flat fading channels; hence avoiding requirement of complex equalization technique which further reduce complexity at receiver [2]. In OFDM the available bandwidth W is divided into N narrowband frequency sub bands or subcarriers. This way each sub bands from N-sub bands experiences flat fading instead of frequency selective fading. Each sub carrier is at equidistant frequency$\left({}^{1}/_{T_s}\right)$, where Ts is the symbol duration$\left(T_s = {}^{N}/_{W}\right)$. Subcarriers are orthogonally placed to avoid ISI [9].

C. *MIMO-OFDM System model.*

The combination of MIMO system with OFDM technology (MIMO-OFDM) is the most promising technology in the field of wireless communication, since it is providing adequate data rate, utilizing available bandwidth, better signal quality and combating against various channel impairments [2]. Figure 2 shows architecture of MIMO-OFDM system. The process begins with the modulation of message signal. Modulation can be carried out using constellation schemes like BPSK (Binary-Phase Shift-Keying), QPSK (Quadrature-Phase-Shift-Keying) or M-QAM (M array Quadrature- Amplitude-Modulation). The complex output of modulation is converted into parallel set of symbols using serial to parallel converter.

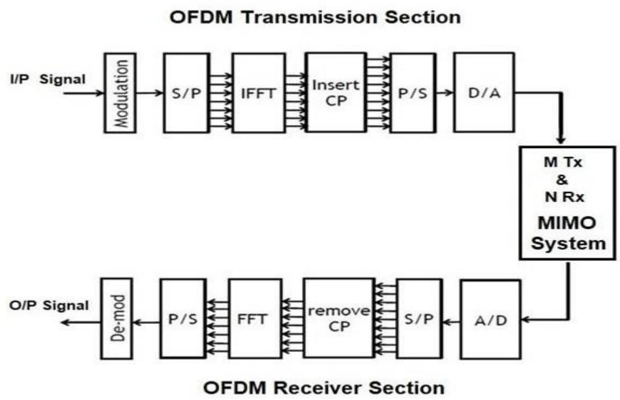

Fig. 2. MIMO-OFDM Architecture

The parallel stream of symbols is applied to the N-Point IFFT (Inverse-Fast-Fourier-Transform). Using N-point IFFT samples of overall complex signal is converted in to time domain from frequency domain and is transmitted over N sub carriers [9, 10, 11]. The output of IFFT is prefixed with last P sample of the previous symbol, known as CP (cyclic-prefix), which provides a block of (N + P) samples known as one OFDM symbol. After adding the CP, each block of data again converted into serial form using parallel to serial converter and inputed to DAC (D-to-A Converter) which converts digital data stream into analog form and then proceeds to transmission over wireless link. The analog output is up converted to transmission frequency before transmission over wireless link [12, 13]. The analog signal is transmitted through MIMO transmitting antennas with/without transmitter antenna selection. The signal transmitted through wireless channel and received at MIMO receiver section via receiving antennas. The received signal is now converted into digital form using ADC (A-to-D Converter). At this point, timing synchronization of symbols is obtained. The output signal of ADC is converted back to parallel data stream using serial to parallel converter. The CP from each block is removed from the OFDM symbols and the resulting signal is fed to the N-point FFT (Fast-Fourier-Transform) to convert the signal in to frequency domain. Before demodulation, parallel signal is converted to serial form using parallel to serial converter and then it is demodulated to obtain original information [14, 15, 16].

III. BIT ERROR RATE.

In a digital wireless communication, number of erroneous bit received per symbol per unit time through communication channel is known as Bit Error Rate (BER). BER performance can be utilized for the comparison analysis of different OFDM modulation scheme. Due to multipath fading in wireless channel signals are received through multiple paths and at the receiver they are added destructively to degrade the system performance which leads to degrade BER performance. Using receiver diversity (Alamouti scheme), transmits diversity (MRC scheme) with BPSK, QPSK, and M-QAM modulation technique BER can be reduced effectively [17, 18].

A. H. Alqahtani et al., observe an experimental setup on BER performance in MIMO-OFDM system. Authors introduce 2×2 antenna systems with RSTBC (Rate-less-Space-Time-Block Code) which assures the reliability of wireless system. In 2×2 MIMO-OFDM system QPSK/16-QAM modulation is used and to minimize ISI, guard signal or CP is used. It is shown that RSTBC is capable of reproducing original signal at loss rate of 10% to 25% for some specific amount of encoded data. It is investigated that BER performance is enhanced with increase in RSTBC blocks. Experiment is carried out to test the BER result for 16-QAM modulation and number of RSTBC blocks L= 1,2,4,6 and 8. The result of simulation and experiment is given in table 1.

Table1 BER performance for RSTBC blocks L= 1 to 8 using QPSK / 16-QAM modulation

Modula-tions	No. of RSTBC blocks	BER (Simulation)		BER (Experimental)	
		LR=10%	LR=25%	LR=10%	LR=25%
16-QAM	L=1	5 x 10^{-1}	5 x 10^{-1}	5 x 10^{-1}	5 x 10^{-1}
	L=2	3.8 x 10^{-2}	1 x 10^{-1}	3.8 x 10^{-2}	1 x 10^{-1}
	L=4	3.5 x 10^{-3}	3 x 10^{-2}	5 x 10^{-3}	3 x 10^{-2}
	L=6	4.5 x 10^{-4}	1 x 10^{-2}	1 x 10^{-3}	0.5 x 10^{-2}
	L=8	6 x 10^{-5}	4 x 10^{-3}	2 x 10^{-4}	6 x 10^{-3}
QPSK	L=1	5 x 10^{-1}	5 x 10^{-1}	4 x 10^{-1}	5 x 10^{-1}
	L=2	5 x 10^{-2}	0.25x 10^{-1}	1x 10^{-1}	0.25 x 10^{-1}
	L=4	5 x 10^{-3}	3 x 10^{-2}	0.25 x 10^{-2}	4 x 10^{-2}
	L=6	5 x 10^{-4}	9 x 10^{-3}	2 x 10^{-3}	0.5 x 10^{-2}
	L=8	0.6 x 10^{-5}	3 x 10^{-3}	4 x 10^{-4}	5 x 10^{-3}

M. El-Absi et al., proposed transmit antenna selection (TAS) for MIMO-OFDM-IA through bulk selection or per-subcarrier selection. This technique is mainly used to improve sum rate and error rate performance under erroneous channel state. Within each node antennas are spatially separated by minimum ʎ/2 (ʎ = wavelength). 02 antenna selection techniques namely MSR (Maximum Sum Rate or Max-SR) and MER (Minimum Error Rate or Min-ER) are employed. An experiment is performed indoor to validate the result of proposed system. Author proposed a Max-SR and Min-ER criterion's to get better sum rate and error rate performance respectively. Table 2 shows BER performance for analytical and deterministic channel at SNR (Signal to Noise Ratio) of 10 dB or more.

Table 2 BER Performance for different antenna selection method

Antenna Selection type	Selection criteria	BER (Analytical Channel)		BER (Deterministic channel)	
Per-subcarrier selection		SNR= 10dB	SNR= 20dB	SNR= 10dB	SNR= 20dB
	Max-SR	10^{-4}	<< 10^{-4}	3 x 10^{-2}	4 x 10^{-3}
	Min-ER	10^{-4}	<< 10^{-4}	5 x 10^{-2}	4 x 10^{-3}
Bulk Selection	Max-SR	4 x 10^{-2}	6 x 10^{-4}	5 x 10^{-2}	10^{-2}
	Min-ER	5 x 10^{-2}	2 x 10^{-3}	5.5 x 10^{-2}	0.5 x 10^{-2}

S. A. Nambi and K. Giridhar, proposed OFDM-IM (Index Modulation) scheme to improve BER performance using QPSK and M-QAM modulation technique. Authors show that the given approach offer better gain performance compared to conventional schemes without affecting spectral efficiency of OFDM. Further they compared BER results of OFDM-IM using 16- QAM and 8-QAM modulation techniques. Using 8-QAM modulation scheme better BER performance is obtained with less complexity at receiver. Table 3 shows BER performances using 16-QAM and 8-QAM modulation techniques.

Table 3 BER comparison for QPSK, 8-QAM and 16-QAM

SNR	BER at spectral efficiency about 2 bits/s/Hz		
	QPSK	8-QAM	16-QAM
10 dB	3 x 10^{-2}	9 x 10^{-2}	7 x 10^{-2}
20 dB	3 x 10^{-3}	9 x 10^{-3}	8 x 10^{-3}
30 dB	2.5 x 10^{-4}	4 x 10^{-4}	4 x 10^{-4}
40 dB	2.5 x 10^{-5}	2 x 10^{-5}	4 x 10^{-5}

A. Afana et al., presented the MIMO scheme with QSM (Quadrature-spatial-modulation) in a co-operative DF (decode and forward) diversity scheme. Analytical and simulation outcomes are compared and they found that QSM provide 3 dB gain over conventional spatial modulation scheme. Two spectral efficiencies of 4 and 6 bits/s/Hz and 2×2 and 4×4 antenna configurations are used to measure average bit error probability (ABEP) versus SNR for analytical calculation and simulation purpose. For 2×2 antenna systems with 4-QAM modulation accomplish 4 bits/s/Hz SE and ABEP of 3×10^{-5} at SNR of 20 dB. Similar result is also obtained with conventional SM (spatial Modulation) using 8-QAM, but the former scheme provides 3 dB gain over SM scheme. Similarly the result for 4×4, QSM-DF system using 4-QAM modulation and spectral efficiency of 6 bits/s/Hz is obtained. When the result is compared with conventional SM technique with 4×4 antenna system and 16-QAM modulation scheme, a gain of 3 dB is obtained.

S.M. Alamouti, proposed transmits diversity technique with 2×1antenna system. Author shows that 2×1 system and MRRC (maximal ratio receiver combining) 1×2 schemes provide similar diversity order. He also shows that $(2 \times M_r)$ antenna system provide diversity order of $2M_r$. No additional bandwidth and feedback from receiver to transmitter required for the scheme suggested by the author. The proposed new scheme with 2×1 antenna systems and BPSK modulation provides 3 dB less gain compared to MRRC technique. Proposed scheme with 1 and 2 receive antennas provide diversity Gain of 15 dB and 24 dB respectively at BER of 10^{-4} in Rayleigh fading channel.

K. Tiwari and D. S. Saini, introduces transmit diversity (Alamouti scheme) and receive diversity (MRC scheme) for enhancing the error performance of wireless link. They employed MIMO-OFDM system with BPSK, QPSK and 16QAM constellation schemes along with STBC code over fading channels to improve the BER performance. The BER performance is improved significantly at the SNR of 0 to 20dB.

T.V. Luong and Y. Ko, investigated BER performance in OFDM-IM (Index modulation) scheme. MRC-GD (Greedy Detector) is employed with PSK modulation scheme for the BER investigation. BER performance is investigated using MRC-GD and compared with BER performance using MRC-ML (Maximum likelihood) detector. It is shown that BER results from both schemes are nearly same at perfect and variable channel state information (CSI) and number of receive antennas L (1, 2, 4, 8). Experimental result shows BER values in the range (10^{-4} to 10^{-5}) at SNR ranges from 0 to 20 dB.

P. Bento et al., considered PSK signal obtained through magnitude modulation (MM) technique. The analytical BER is examined for both flat fading channel and time varying channel. They proposed a BER expression that depends upon only the order of modulation and the Kullback–Leibler divergence of the MM factors' PDF from the Gaussian one, and the expression found to be very precise. The analytical and Experimental result shows BER values in the range (10^{-4} to 10^{-5}) at SNR ranges from 0 to 18 dB.

It is found that spatially modulated OFDM has better BER performance compared to other OFDM scheme at lower spectral efficiency. At higher spectral efficiency BER is greatly affected due to trade off between spatial diversity $(M_t \times M_r)$ and constellation size [19].

IV. PAPR REDUCTION TECHNIQUES.

OFDM is the most promising technology in high-speed wireless network. It is an efficient system providing high spectral efficiency and combating inter-symbol interference (ISI). But its performance seriously affected due to presence of high PAPR [20, 21]. High PAPR is one of the key issue in OFDM technology [22]. PAPR is defined as the ratio of peak signal power to the average signal power [16]. OFDM system consists of orthogonal subcarriers, which are logically added in IFFT leads to produce some large peaks at the output [23]. Large peaks in output signal may cause out of band radiation and signal distortions [24]. To accommodate such large peaks in OFDM system, highly linear analog devices like DAC and PA (Power Amplifier) are required [19, 25]. While dealing with large peaks, the PA may enters into saturation and exploit large amount of system power [26]. To back off operating point of PA so as to handle large peak signal in linear region, leads to drop efficiency of PA and degrade SNR [23, 27, 28]. Most of the PAPR minimization schemes face tradeoff between various performances such as BER, Spectral efficiency (SE) and computational complexity [19, 23]. Many PAPR reduction schemes have been introduced namely ICF (Iterative Clipping and Filtering), ICTF (Iterative Companding Transform Filtering), Bayesian approach, SLM (Selective Mapping), PTS (Partial Transmit Sequence) and tone reservation (TR) and so on [21,27,29].

H. Bao et al., proposed a Bayesian approach by employing the surplus degrees-of- freedom of the transmit array in an adaptive PAPR reduction technique. The GAMP (generalized -approximate message passing) when combined with EM (Expectation Maximization), computational complexity is reduced. Simulation result of proposed method shows enhancement in PAPR performance and computational complexity over conventional schemes. To perform experiment, TGM (Truncated Gaussian Mixture) based EM-TGM-GAMP algorithm is planned. The experimental result of EM-GTM-GAMP is compared with FITRA and ZF (Zero Forcing) algorithm. Analytical result shows that proposed algorithm has advantage over FITRA, ZF and iterative clipping. Proposed algorithm gives lowest PAPR result of 08 dB where as FITRA, Clipping and ZF algorithm gives PAPR of 2.4 dB, 4.3 dB and 10.6 dB respectively. SER performance is also obtained for all the above said algorithms, ie for FITRA algorithm SER = 10^{-3} at SNR of 11 dB. Similarly for SER for ZF, FITRA and Clipping, SER = 10^{-3} at the SNR of 8 dB, 9.5 dB and 15 dB respectively.

S. Gokceli et al., proposed two new algorithms namely enhanced ICEF (Iterative Clipping and Error Filtering) and FC (fast convolution) processing. The Enhanced-ICEF (E-ICEF) algorithm cancel out INI (inter numerology interference) between each BWP (bandwidth parts) along with PAPR minimization. In FC algorithm allows block wise PAPR minimization. The proposed E-ICEF algorithm based on cancels out INI between each BWP through the iterative process of PAPR minimization. Result shows significant reduction in PAPR. Parameters considered for the analytical results are; PRB size =20 subcarriers, Modulation order QPSK, 64-QAM and Maximum number of (I/E/FC)-ICEF iterations = 20. At 1% probability, Complementary Cumulative Distribution Function (CCDF) = 10^{-3} and target PAPR-5dB. Result shows PAPR performance for IICEF (Independent ICEF), E-ICEF, FC-ICEF as 7.3 dB, 5.2 dB and 5.1dB respectively. It is found that PAPR performance of E-ICEF and FC-ICEF shows very close performance to the target 5dB PAPR.

S. Gökceli et al., also proposed a PAPR reduction scheme for frequency selective fading channel, where clipping noise controlled and filtered in the transmitter pass band. Simulation result for the target PAPR = 6 dB, CCDF 0.1%, Modulation QPSK and 16-QAM, and ICEF PAPR reduction algorithm over 1 to 20 iterations given in table 4.

Table 4 The PAPR performance using ICEF

Reduction Technique	No of Iterations	PAPR for CCDF = 0.1%
ICEF	1	8.3 dB
	10	6.3 dB
	20	6.0 dB

K. Anoh et al., proposed MC (µ Law Companding) PAPR minimization technique. In this method amplitudes of low power signals are enhanced without affecting signals with high amplitude. But this process limits the PAPR performance, thus new method known as RBMC (Root based µ Law Companding) have been suggested, where OFDM signals are simultaneously compressed and amplified. The result of RBMC technique is better than other popular companding techniques keeping BER value at desired level. Simulation result of MC technique for µ=30 , PAPR equals to 4.6 dB at CCDF of 0.01% and BER performance equals to 10^{-5} at 16 dB SNR.

F. Gao et al., suggested a new hybrid PTS model where IPTS (iterative partial transmit sequence) and Clip method are combined for PAPR reduction. The proposed scheme gives better result of PAPR reduction as compare to conventional PTS scheme and clipping algorithm separately. The threshold value of proposed scheme is optimized by 1.01 dB and 4.09 dB when compared with PTS splicing and IPTS scheme and it is optimized by 2.60dB and 0.08 dB when compared with conventional PTS scheme and the Clip method. The result of simulation of PAPR performance at probability (CCDF) of 10^{-4} for different PTS and Clipping method is given in Table 5.

Table 5 The PAPR performance at CCDF of 10^{-4} for different PTS methods

Reduction Technique	PAPR for CCDF = 10^{-4}
Original	11.3 dB
PTS	9.5 dB
IPTS	8.8 dB
Clipping (4 clips)	6.5 dB
PTS-Clipping	6.25 dB
IPTS-Clipping	5.19dB

Lahcen Amhaimar et al., proposed a PTS (Partial-Transmit-sequence) with firework algorithm (FWA) for PAPR reduction in MIMO-OFDM system. This PTS-FWA scheme is employed to lessen the PAPR with minimum computational complexity. From the simulation result, it is shown that the given PTS-FWA method provides better PAPR performance as compared to other schemes. Table 6 shows PAPR values at CCDF of 10^{-3} for FWA (Firework-Algorithm), SPSO (Standard-Particle-Swarm Algorithm), SA (Simulated-Annealing), PTS (Partial-Transmit-sequence), GA (Genetic-Algorithm), and SLM (Selective-Mapping) scheme.

Table 6 PAPR for different algorithms at CCDF of 10^{-3}

	FWA	SPSO	SA	PTS	GA	SLM
PAPR at 10^{-3} CCDF	4 dB	4.421 dB	4.948 dB	5.226 dB	5.879 dB	7.034 dB

P. Gupta et al., proposed a new scheme of PAPR optimization using DCT (Discrete Cosine Transform) with SLM scheme. This scheme performs better as compared to other schemes and same has been depicted through simulation result which shows significant gain is accomplished using SLM-DCT scheme. Suggested SLM-DCT scheme effectively minimize PAPR without affecting BER performance. Simulation is carried out on following parameters; number of subcarriers = 32 to 128, phase sequences = 1, 2, 4, 8, 16, 32, 64, 128, and M-PSK (M=order of modulation) modulation. Proposed method achieves gain of 1.35 dB at CCDF of 10^{-3} for different phase sequences from 1 to 8.

S.H. Wang et al., proposed a new PAPR lessening scheme with frequency-domain phase rotation, cyclic shifting, complex conjugate, and sub-carrier reversal operations in order to increase the diversity of the signals. The analytical and experimental result shows that proposed scheme reduces PAPR significantly compared to traditional SLM scheme.

K.H. Kim, proposed OFDM-IM multicarrier scheme employing multi-level dithers signals in the idle subcarriers to minimize the PAPR. Multi-level dither signals are added in idle subcarriers such that the amplitudes of the symbols in the active subcarriers are variously distributed for different sub-blocks. Proposed scheme accomplishes good BER performance compared to single level dither signal. At the CCDF of 10^{-2} the PAPR is found to be 6 dB in proposed scheme.

B. Tang et al., proposed a clipping-noise compression scheme which reduces computational complexity such that that only one FFT is required for this approach. This scheme show good PAPR and BER performance compared to conventional ICF scheme. Proposed method provide BER value in the range of (10^{-3} to 10^{-4}) at the SNR of 10 to 15 dB. Also the PAPR value at the CCDF of 10^{-3} is found to be 4.5 dB in proposed scheme.

V. Expected Result

This section mainly highlights on PAPR reduction schemes in perspective of BER performance and PAPR in future MIMO-OFDM wireless system. Different modulation schemes with different combination of transmit and receive antennas $(M_t \times M_r)$ is overviewed for enhancing overall performances of including error rates, PAPR, Spectral-efficiency and computational complexity of the future wireless system. Based on findings of various reviewed literature, the key observations has been tag and summarized. Table 1 to 3 summarizes BER performances and Table 4 to 6 summarizes PAPR performances using different algorithms and methods. It is also understood from the above cited literatures that various techniques, schemes and algorithms are playing important role to enhance the performances (BER, SER, and PAPR) of the wireless system under the umbrella of MIMO-OFDM technology. It is found that there are some tradeoffs between PAPR, BER, SE and computational complexity which compromising any of facilities like QoS (Quality-of-Service) range of communication, throughput and healthy network link.

VI. Conclusions.

This article is presenting the performance enhancement of the MIMO-OFDM scheme without affecting system stability and key parameters. The MIMO-OFDM systems with space time block code (STBC) schemes leads to offer optimized error rate performance. The packets loss and data link degradation can be delimited by employing RSTBC and Alamouti's space time block code schemes. From literature review it is found that the BER values ranges in between 10^{-3} to 10^{-4} at the SNR value in between 8 dB to 15 dB. Some of promising techniques for the PAPR reduction are ICF, ICTF, PTS and SLM and Bayesian approach. Among these ICF technique is still doing well and minimizes PAPR up to satisfactory level without affecting BER much. The MIMO technology is found to be good candidate to offer spatial diversity that further improves the QoS (Quality of service) and the system channel capacity. The error rate presentation of the MIMO-OFDM schemes can be boosted by adopting various schemes, antennas configuration and algorithms such as MRC scheme and Alamouti scheme which offer better error rate and throughput using less number of antennas at receiver and transmitter. ICF as PAPR reduction scheme and 2×2 & 2×1 antenna configuration or MRC scheme is found to be the best suitable scheme for enhancing BER and PAPR performance of the wireless system which fulfill the requirement of next frontier wireless system (5G) using 16-QAM or QPSK modulation. Also this scheme when used in MIMO-OFDM systems leads to high SE with optimized PAPR, BER and ISI. The MIMO antenna (4×1) configuration take up the transmit power within range of 100mw to 150 mw with per sub-carrier and bulk carrier selection. Different MIMO antenna configurations such as 2×2, 4×4, 2×1, 1×2, 4×1, and 4×2 may be adopted to attend the high throughput, better SE and error rate performance.

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