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A REVIEW ON MIMO OFDM SYSTEM UNDER CHANNEL ESTIMATION

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ABSTRACT

Orthogonal Frequency Division Multiplexing (OFDM) is a technique of encryption digital information on multiple carrier frequencies. it's one of the modulation techniques which are multi-carrier, provides a high spectral efficiency, immunity to the frequency selective weakening channels, power efficiency and multipath delay unfold tolerance. it's a lot of advantageous over alternative technologies. although its benefits it's some obstacle additionally. The high peak-to-average ratio is the main obstacle that causes non-linearity at the receiving finish. One in all the main disadvantages in OFDM communication is the high peak-to-average power ratio (PAPR). in this paper we discuss regarding the PAPR within the OFDM system, its impact and a few techniques name which may be used to reduce the PAPR according to our need. This approach has the potential of reducing the PAPR of the OFDM without affecting the bandwidth efficiency of the system and the Bit Error Rate (BER) performance.

Keyword : OFDM,MIMO,SNR

I. INTRODUCTION

Multiple Input Multiple Output (MIMO) systems are a natural extension of developments in antenna array communication. MIMO systems include multiple transmission antennas at the transmitter and multiple receiving antennas at the receiver. the benefits of MIMO communication, that exploits the physical channel between several transmit and receive antennas, are presently receiving vital attention[1]. MIMO systems give variety of benefits over single-antenna-to-single-antenna communication. Sensitivity to fading is reduced by the spatial diversity provided by multiple spatial ways. underneath sure environmental conditions, the facility necessities related to high spectral efficiency communication will be considerably reduced by avoiding the compressive region of the information-theoretic capability sure. Here, spectral potency is outlined because the total range of information bits per second per Hertz transmitted from one array to a different. Impressive enhancements in capability and bit error rates (BERs) have increased the recent interest in multiple-antenna systems. along with the gains, however, comes a value in hardware quality. The radio front has quality, size and value that scale with the number of antennas. it's potential to alleviate this price and at a similar time capture several of benefits of MIMO systems by away called antenna choice capability of the channel will increase linearly with S/N (SNR) at low SNR, however will increase logarithmically with SNR at high SNR. during a MIMO system, a given total transmit power will be divided among multiple spatial ways, driving the

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capability nearer to the linear regime for every mode, therefore increasing the aggregate spectral efficiency MIMO systems modify high spectral potency at abundant lower needed energy per data bit. The graph of data rate versus no. of antenna elements is shown in figure one. From the graph, it's clear that MIMO capability has linear relationship whereas SIMO/MISO capability has exponent relationship with the quantity of antenna parts. Thus, creating MIMO, the topic of debate for economical wireless communication [2,3]

II .MIMO SYSTEM MODEL

MIMO system model; generate OFDM with success the connection between all the
carriers must be carefully controlled to take care of the orthogonally of the carriers. OFDM have many engaging options that build it a lot of advantageous for top speed data transmission over alternative data transmission techniques. These options includes [5, 6]

(i) High Spectral Efficiency
(ii) strength to channel fading
(iii) Immunity to impulse interferences
(iv) Flexibility
(v) Easy equalization

But inspite of these benefits there are some obstacles in using OFDM:

(i) OFDM signal contains very high Peak to Average Power Ratio (PAPR)
(ii) Very susceptible to frequency errors (Tx. & Rx.offset)
(iii) Inter carrier Interference (ICI) between the
Subcarriers

III. OFDM MULTICARRIER TRANSMISSION TECHNIQUE

OFDM is a Multicarrier Transmission technique that divides the obtainable spectrum into several carriers each being modulated by a low rate stream. OFDM is comparable to Frequency Division Multiple Access (FDMA) therein the multiple user access is achieved by sub-dividing the obtainable bandwidth into multiple channels, that ar then allotted to users. but OFDM uses the spectrum additional far more rather more way more} with efficiency by spacing the channels more closely at the same time. this can be achieved by creating all the carriers orthogonal to at least one another, preventing interference between the closely. Multiple Input Multiple Output (MIMO) has been called a method to reinforce the transmission quality and capability. OFDM is obtained with Multiple-Input Multiple-Output (MIMO) configuration to extend the range gain and to boost the system capability.[4] The subcarrier waveform shaping in OFDM may be a style of preceding methodology wherever every OFDM block is linearly reworked by shaping matrix before modulation and transmission. Orthogonal frequency-division multiplexing (OFDM) may be a very talked-about technique for digital transmission over frequency selective channels. due to the transmitter side signal process a rather high peak-to-average-power-ratio (PAR) happens, that ends up in non-linear distortion of the ability amplifier and in turn to out-of-band radiation. In order to avoid these problems a transmitter side formula is important to decrease the

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PAR. OFDM uses the spectrum far more ably by spacing the channels nearer along. this can be achieved by creating all the carriers orthogonal to at least one

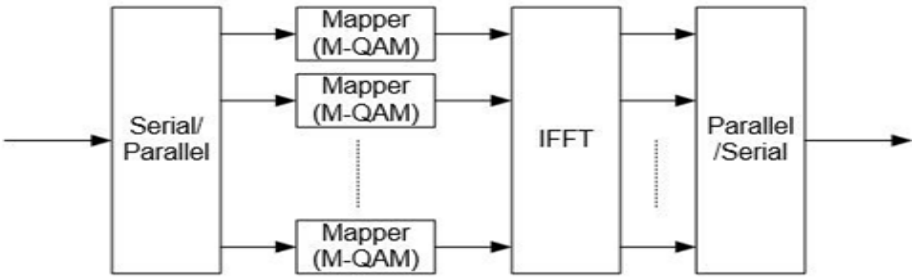

Fig.1. Principle schematic of OFDM modulator[4]

FDMA wastes the spectrum as a result of the need of inserting guard bands between channels for channel separation and filtering. during a typical system, up to 500th of the overall spectrum is wasted during this manner[4]

IV. PREVIOUS WORK

As the development of wireless communications technology, the need to produce high speed information services and wide bandwidth will increase. MIMO-OFDM (Multi Input Multi Output - Orthogonal Frequency Division Multiplexing) will give greater info capacity and provide the standard of high-speed info in real time on a more robust multipath fading channel. massive the massive the big} variety of antenna in MIMO system resulted in power being consumed more and more large. The antenna system with Single oftenest energy that can streamline lower price. the combination of MIMO-OFDM based single RF produces trendy technology for the development of telecommunications in the analysis and analysis on performance of MIMO systems SIC-based detection using a single RF using convolutional code. This analysis is finished by making a simulation of MATLAB programs. The modulation technique used is QAM modulation. Channel model that may be used in this simulation is Rayleigh fading with added noise AWGN. The detector used in this technique is that the sic (Successive Interference Cancellation). Channel estimation is performed using the MMSE (Minimum Mean sq. Error).By having this information channel estimation of channel is known for the sake of achievement of a high transmission rate and good quality. The results of this paper is the resulting performance of the system is expressed in the type of the curve of BER as a operate of SNR with the amount of various modulation curve and also the channel estimations that area unit displayed with the estimated magnitude and phase curves to change index subcarrier.[8]

Josef Urban ,Roman Marsalek[2007]focused in the domain of peak to average power ratio (PAPR) reduction of orthogonal frequency division multiplex (OFDM) signals. The main idea is to use a combination of data interleaving with repeated clipping and filtering method (or its improved no iterative version) in order to increase the overall performance for the PAPR reduction. The performance is evaluated in AWGN channel with presence of Salch nonlinearity model. Another contribution of the paper is a study of influence of side information coding on total bit error probability.[9]

The concept of Orthogonal Frequency Division Multiplexing (OFDM) has been known since 1966, however it solely reached sufficient maturity for preparation in normal systems throughout 1990s. OFDM is an attractive

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modulation technique for transmittal large amounts of digital information over radio waves. One major disadvantage of OFDM is that the time domain OFDM signal that may be a add of many sinusoids ends up in high peak to average power ratio (PAPR). number of techniques are proposed within the literature for reducing the PAPR in OFDM systems. in this paper the varied techniques proposed for reducing the PAPR and therefore the choice criteria for selecting these techniques are mentioned. The goal is to convey the elemental ideas and intuitive understanding of the construct introduced. this can be done primarily to give an outline of the varied techniques known these days for PAPR reduction.[10]

R. de Lamare [2008] Minimum Mean Squared Error (MMSE) iterative successive parallel arbitrated decision feedback (DF) receivers for direct sequence code division multiple access (DS-CDMA) systems. the MMSE design criterion for DF multiuser detectors beside successive, parallel and iterative interference cancellation structures. a unique efficient DF structure that employs successive cancellation with parallel arbitrated branches and a near-optimal low complexness user ordering algorithm are presented. The proposed DF receiver structure and also the ordering algorithm are then combined with iterative cascaded DF stages for mitigating the deleterious effects of error propagation. Simulation results for AN uplink scenario with encoded systems assess the new iterative DF detectors against linear receivers and measure the effects of error propagation of the new cancellation methods against existing schemes[11]

H. Lee [2006] Multiple-input-multiple-output (MIMO) systems give a very promising means that to extend the spectral efficiency for wireless systems. By using orthogonal frequency-division multiplexing (OFDM), wideband transmission may be achieved over frequency-selective fading radio channels. An improved vertical Bell Labs layered space-time (V-BLAST) receiver that takes the decision errors into account. Second, an iterative detection and decryption (IDD) scheme for coded layered space-time architectures in MIMO-OFDM systems. For the iterative method, a low-complexity is developed by creating use of each nonlinear interference cancellation and linear minimum mean-square error filtering. Also, a straightforward cancellation technique based on hard decision is presented to reduce the general complexness. Simulation results demonstrate that the proposed IDD scheme combined with the improved V-BLAST performs almost as well because the optimal turbo-MIMO approach, whereas providing tremendous savings in computational quality. [12]

V.PROBLEM OF PEAK-TO-AVERAGE POWER RATIO IN OFDM SYSTEMS

High Peak-to-Average Power ratio has been predictable as one of the major sensible issue involving OFDM modulation. High PAPR results from the nature of the modulation itself wherever multiple subcarriers/ sinusoids are other jointly to make the signal to be transmitted. once N sinusoids add, the peak magnitude would have a worth of N wherever the quality can be quite low attributable to the negative interference between the sinusoids. High PAPR signals are usually unnecessary for it always strains the analog circuitry . High PAPR signals would need an outsized vary of dynamic linearity from the analog circuits that typically results in exclusive devices and high power utilization with lower potency (for e.g. power electronic equipment needs to operate with larger back-off to take care of linearity). In OFDM system, some input sequences would result in higher PAPR than others. for instance, associate input sequence that needs all such carriers to transmit their most amplitudes would completely lead to a high output PAPR. so by preventive the possible input sequences to

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a negligible sub set, it should be potential to achieve output signals with a assured low output PAPR. The PAPR of the transmit signal x(t) is the ratio of the utmost instantaneous power and the average power[7]

Where E {.} denotes expectation operator If a symbol may be a sum of N signals each of most amplitude equal to one volt, then it's conceivable that we may get most amplitude of N Volts, that is, all N signals add at a moment at these most points. For an OFDM signal, that has 126 carriers every with normalized power of 1W, then the utmost PAPR will be as giant as ten log10 126 or 21 db. this can be at the moment once all 126 carriers combine at their maximum purpose unlikely however possible [7]. The RMS PAPR are going to be around 1/2 the number as 10-12 decibel. the massive amplitude variation will increase in-band noise and will increase the Bit Error Rate (BER) that the signal has got to undergo amplification nonlinearities

VI. CONCLUSION

Multicarrier systems are proving better in transmission than single carrier systems. OFDM may be a digital multi-carrier modulation technique where a good number of closely spaced orthogonal sub- carriers are used to carry information. one of the main drawbacks of in OFDM systems is that the complicated transmit signal will show a really high PAPR when the input sequences are extremely associated. paper, represent various necessary side associated with the PAPR & its overall effect on the OFDM system & provide names many techniques adopted by the system according to the need. These techniques may be used to reduce the PAPR at the price of loss in data rate, transmit signal power increase, BER performance degradation, and computational problem increase.

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