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An Enhanced Technique for PAPR Reduction in Mobile WIMAX

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Abstract - *High PAPR is an serious defect in optical OFDM systems, deteriorating nonlinear impairment in optical fibers. This investigates the peak-to-average power ratio (PAPR) theory in the optical orthogonal frequency division multiplexing (OFDM) in the optical fiber communication systems. Many standards in wireless such as (Wi-Max, IEEE802.11a, LTE, DVB) has used the OFDM technology to increase dramatically future wireless communications. On the other hand, WiMAX is one of the hottest broadband wireless technologies nowadays. WiMAX systems are used to deliver broadband access different services to customers in an economical way. But, due to outside interference, these (WIMAX and OFDM channels) experience the negative effect of a higher value of peak to average power ratio (PAPR or we also call it crest factor). The main disadvantage of the OFDM has its high PAPR (Peak to Average Power Ratio). High PAPR is a serious intrinsic defect in many optical systems, deteriorating nonlinear impairment in optical fibers. We aim to reduce this value and provide a better communication channel. A peak to average reduction method that exploits the precoding and beamforming mode in WiMAX. the method is applicable to any OFDMA system that implements beam forming using dedicated pilots which use the same beam forming antenna weights for the data. The best solution of the multipath fading channel is multicarrier modulation techniques for wireless communication. An dummy sequence insertion technique and partial transmit sequence has been considered for PAPR and complexity reduction. comparison of fixed and mobile WiMAX systems using hybrid techniques for papr reduction partial transmit sequence and dummy sequence insertion techniques are well-known distortion less peak to average power reduction ratio techniques to improve the performance of orthogonal frequency division multiplexing systems. There are many techniques simulated for scalable OFDM system. The Reduction of PAPR problem is focused on many signal transformation. These techniques are used before amplification then inverse transforms at the receiver and before demodulation .This approach the transformed signal has best achievable PAPR and non-linear distortion are avoided, phase modulation is more preferable for PAPR reduction in the OFDM-based system.*

Keywords: Broadband services, Mobile WIMAX, PAPR, Frequency Division Multiple Access (OFDM), DST (Discrete Sine Transform Matrix)

1. INTRODUCTION

This increase in the broadband services used by all people all over the world. In order to achieve high data rates and to support all applications of broadband in a multipath environment, more effective modulation scheme in form of multicarrier scheme are adopted. this is Based on these the concept that WIMAX allows for an efficient use of bandwidth in wide frequency range and be used as a solution for broadband internet access. The effect of a high PAPR are the low power efficiency of the high power amplifier and signal distortion caused by operation in the non-linear region of the high power amplifier, low power efficiency needs large dynamic range. This increasing cost of the system and signal distortion induces degradation of the BER.

PAPR reduction technique is used OFDM system have some disadvantages having large PAPR as well as high sensitivity to synchronization error to deal with this PAPR problem.Several techniques have been developed such as for instance coding and tone reservation clipping/filtering, peak windowing and receiver correction algorithm such as iterative decoding. An alternative way of reducing the PAPR problem is focused around signal transformation phase modulation. Phase modulation is more preferable for PAPR reduction in the OFDM-based system. For the digital modulation schemes, OFDMA is one of the multi-user version This Provides extensively low data rate transmission from several users. OFDMA can be said as an alternative to combining OFDM with time division multiple access (TDM . In this Low-data-rate users can be easily send continuously with low transmission power instead of using a "pulsed" high-power carrier. OFDMA can also be described as a combination of frequency domain and time domain multiple access ,hence the resources are partitioned in the time-frequency space, and slots are assigned along the OFDM symbol index as well as OFDM sub-carrier index. OFDMA is considered as highly suitable for broadband wireless networks, due to advantages such as scalability and the use of multiple antennas, and there ability to take advantage of various channel frequency selectivity .In various spectrum , OFDMA is an possible approach for filling various free radio frequency bands adaptively. OFDMA can be used in the mobility mode of

the IEEE 802.16 Wireless MAN standard is commonly referred to as WiMAX, the IEEE 802.20 mobile Wireless MAN standard, commonly referred to as MBWA, various downlink of the (LTE) fourth generation mobile broadband standard. The radio interface was formerly named *High-Speed OFDM Packet Access* (HSOPA).OFDMA has many advantages such as Flexibility of deployment across various frequency bands with little-needed modification to the air interface provides many interferences from neighboring cells, with the use different basic carrier permutations between different users in different cells. It has many Interferences within the cell ahas been averaged by using allocation with the use of cyclic permutations which Enables Single Frequency Network coverage, where coverage problem exists and gives excellent coverage.

1.1 WIMAX

Mobile WiMAX provides a rich set of features that offers considerable flexibility in many terms , as well as many potential applications. Mobile WiMAX provides a capacity of tens of megabits per second per channel from each base station with a baseline configuration. The high data throughput enables us to provide efficient data multiplexing and provide low data latency [4]. The physical layer of WiMAX used OFDM. This thus provides strong performance in the multipath and non-line-of-sight (NLOS) environments**.** Basically Mobile WiMAX extends the OFDM PHY layer to support efficient multiple-access. Mobile WiMAX has been able to support a wide range of bandwidths. High PAPR is a serious intrinsic defect in all-optical OFDM systems, deteriorating nonlinear impairment in optical fibers. Many wireless standards has been adopted the technology of OFDM to increase future wireless communications. Wi-Max is a state of the art wireless broadband technology facilitates high-speed mobile internet access to the portable devices like laptops, Net books, Smartphones, PDAs etc. WiMAX is different from wifi it is not WiFi, it will fill in up between different hotspots and extends the Internet access . it can be said in other words, that it is a combination of WiFi and cell phone technology. WiMAX Broadband can be termed as the fourth generation (4G) wireless technology as its usage , which is an effective and economical alternative to the costly DSL broadband system. [2] The present WiMAX broadband system provides up to 40Mbps . WiMax wireless broadband system can be an effective replacement for the GSM and CDMA cell phone technologies. Besides of the high-speed Internet access, WiMAX systems can deliver reliable cum fast VoIP(Voice over internet protocol) and IPTV services to the customers.

1.2 BROADBAND TELECOMMUNICATION

In wireless telecommunications system, broadband provides wide bandwidth for data transmission with an ability to simultaneously transport multiple signals and traffic types. The medium used can be coaxial cable, optical fiber, radio or twisted pair.. "Broadband" is a relative term, understood according to its context. This broadband is often divided into channels or "frequency bins" using pass band techniques to allow frequency-division multiplexing instead of sending a higher-quality signal.

the Broadband Integrated Services Digital Network (B-ISDN) used the term to refer a broad range of bit rates, independent of physical modulation details.[3] The various forms of digital subscriber line (DSL) services over *broadband* the digital information is sent over multiple channels. Every channel is at a higher frequency than the baseband voice channel, so it can support plain old telephone service on a single pair of wires at the same time. However, when that same information is converted to a non-loaded twisted-pair wire (no telephone filters), it becomes hundreds of kilohertz wide (broadband) and can carry up to 100 megabits per second using very-high-bit-rate digital subscriber line (VDSL or VHDSL) techniques.

2.OBJECTIVE

Basically, the main objective we should reduce the PAPR and improves the efficiency of the broadband services in terms of MSE and PSNR, so that everyone can take the broadband services without PAPR and have low cost because due to high PAPR the chances of operating point for linear power amplifier being shifted toward high saturation region at any given time. wireless communications standard such as worldwide interoperability for microwave access is designed to provide 30 to 40 megabit-per-second data rates, with the 2011 update providing up to 1Gbit/s for fixed stations.. The forum has described WiMAX as an standards-based technology which enables the delivery of last mile wireless broadband access which can be as an alternative to cable and DSL". Following the much wider deployment of the competing 4G LTE standard and the commercial failure of the largest WiMAX network (Clear wire), WiMAX has failed to achieve dominance in the marketplace and remains in use in niche markets only.Takes OFDM is considered to be its physical layer to satisfy and guarantee the big data rates in frequency selective environment. high PAPR is the main disadvantage for OFDM. This issue can be avoided by changing dynamic range of power amplifier and increasing

it. It will surely pave way for large size and higher production cost of the power amplifier. hence if we take into consideration the power constraint problem it is very much required and necessary to reduce PAPR. Since focuses on applying discrete sine transform in the transformation process, there are numerous transformation techniques which can be applied in this system, some of the examples of the transformation technique which can be applied in place of DST.

3. METHODOLOGY

The whole scenario is divided into two parts one is the sender and other is are a receiver. The process starts from sender side, it starts with an input data stream which carries data to a data stream which carries data to be transmitted, this then fed into the mapper which maps each bit per transmission. The bit then converted into a parallel bit stream using serial to parallel converter. Then we perform discrete sine transform of this parallel data. again, it passes through mapper called subcarrier mapper which passed into the carrier signal. The digital signal is converted into analog using digital to analog converter this data then transferred into the channel.

The channel will add noise to our transmitted signal which cannot be avoided so we add AWGN to our signal to simulate the noise on the receiver side, the process is opposite of that of sender process .The received analog signal is converted into digital signal then Fast Fourier transform is done for the signal, and then the subcarrier de-mapping operation is performed with the help of which we get proper order of our bits. Then inverse discrete sine is performed. This parallel bit stream is converted into serial data and finally, mapping of serial data is performed to get received signal.

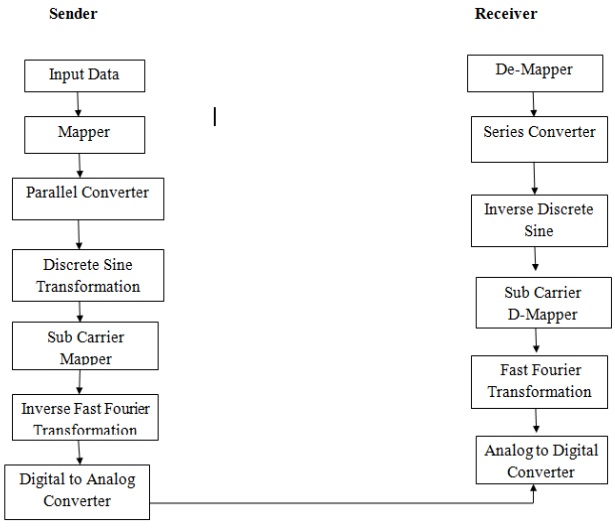

FIGURE-l

4. OFDMA (ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS)

Orthogonal Frequency-Division Multiple Access (OFDMA) is a multi-user version of the popular orthogonal frequency-division multiplexing (OFDM) digital modulation scheme. Multiple access is achieved in OFDMA by assigning subsets of subcarriers to individual users. This allows simultaneous low data rate transmission from several users. OFDMA can be seen as an alternative to combining OFDM with Time Division Multiple Access (TDMA) or time-domain statistical multiplexing communication. Low-data-rate users can send continuously with low transmission power instead of using a "pulsed" high-power carrier. Constant delay and shorter delay can be achieved. OFDMA can also be described as a combination of frequency domain and time domain multiple access, where the resources are partitioned in the time-frequency space, and slots are assigned along the OFDM symbol index as well as OFDM sub-carrier index. OFDMA is considered as highly suitable for broadband wireless networks, due to advantages including scalability and use of multiple antennas (MIMO)-friendliness, and ability to take advantage of channel frequency selectivity.[1]In spectrum sensing cognitive radio, OFDMA is a possible approach to filling free radio frequency bands adaptively. OFDMA is used in the mobility mode of the IEEE 802.16 Wireless MAN standard, commonly referred to as WiMAX, the IEEE 802.20 mobile Wireless MAN standard, commonly referred to as MBWA, the downlink of the 3GPP Long Term Evolution (LTE) fourth generation mobile broadband standard. The radio interface was formerly named *High-Speed OFDM Packet Access* (HSOPA), now named Evolved UMTS Terrestrial Radio Access (E-UTRA). Mobile Flash-OFDM then now defunct Qualcomm/3GPP2 Ultra Mobile Broadband (UMB) project, *Wireless Regional Area Networks* (WRAN). The OFDMA has many advantages such as Flexibility of deployment across various frequency bands with little-needed modification to the air interface provides Averaging interferences from neighboring cells, by using different basic carrier permutations between users in different cells. It has interferences within the cell are averaged by using allocation with cyclic permutations and Enables Single Frequency Network coverage, where coverage problem exists and gives excellent coverage. It Offers Frequency diversity by spreading the carriers all over the used spectrum. It allows per channel or per subchannel power

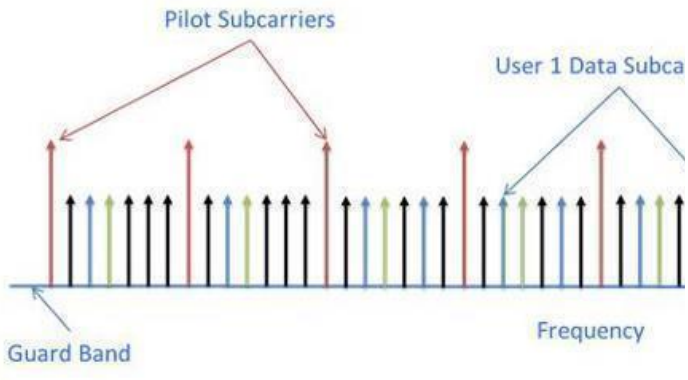

Fig -1: OFDMA

5.RELATED WORK

Many pre-coding techniques has been used to reduce PAPR in mobile WiMAX. Those techniques are non-linear companding technique. OFDM supported low complexes transform to extend multipath residence and cutback PAPR. However, it's the disadvantage like higher modulation order, degradation of BER and SNR performance, increasing of average powering the integrity of the specification, however, here PTS technique is employed. It overcomes the disadvantage of higher than techniques.The mobile WIMAX air interface adopts orthogonal frequency division multiple access as multiple access technique for the uplink and downlink transmission, all the OFDMA based system which includes mobile WIMAX, which experiences the problem of high peak to average power ratio. Each symbol block is linearly transformed by a pre-coding matrix before OFDM modulation and transformation in linear pre-coding. It provides a comparison of three typical linear pre-coding techniques: Hadamard transform pre-coding, discrete sine transform pre-coding and square root raised cosine function pre-coding used in OFDMA system. [1,2]

The analysis of the multicarrier transmission based on peak-to-average power ratio reduction techniques based on Signal distortion technique. Multiplexing a serial data symbol stream into many orthogonal sub-channels makes the multicarrier signals spectral bandwidth efficient. The performance of multicarrier modulation system over frequency selective fading channels is better than that of the single carrier modulation system. Multipath reflects the signal with different phases and time arrivals. The best solution of the multipath fading is OFDM. Orthogonal Frequency Division Multiplexing (OFDM) is a multicarrier modulation technique for high-speed data transmission over multipath fading channels for wireless communication. One of the main problems is high peak to average power ratio (PAPR) which leads to power inefficiency in RF section of the transmitter [3,4]

Mobile WiMAX is a 3rd generation broadband wireless technology that enables the convergence of mobile and fixed broadband networks through a wide area radio access. Since January 2007, the IEEE 802.16 working group has been developing a new amendment the IEEE802.16 standards i.e. IEEE 802.16 m as an advanced air interface to meet the requirements of ITU-R/IMT advanced for 4G systems. The mobile WiMAX air interface adopts orthogonal frequency division multiple access (OFDMA) as multiple access techniques for its uplink and downlink to improve signal performance affected by multipath distortion. The number of sub-blocks in PTS and the number of dummy subcarriers has been changed to analyze the effect on PAPR. By using DSI-PTS technique, the PAPR is reduced as compared to the conventional PTS and reduction in the computational complexity is achieved. The simulations have been observed for Mobile WiMAX standard by varying the number of sub-blocks and dummy subcarriers [5,6]

The PAPR reduction performance using the cumulative distribution function plot. The bit error rate performance is also being analyzed here with following this PAPR reduction technique it requires to send extra Side Information (SI) index along with the transmitted OFDM signal and error in detecting these extra bits at the receiver leads to data loss. Without sending this SI index the detection of this thing will also be possible with following the sub-optimal algorithm at receiver. The proposed system is based on precoding the constellation symbols with ZCMT precoder. the proposed system has better PAPR gain than the Hadamard transform (WHT) precoded distribution. [7,8]

WiMAX will compete with wireless LANs (Local Area Networks), 3G (3th Generation) cellular services, and possibly wireline services like cable and DSL (Digital Subscriber Line). The ability of WiMAX to challenge or supplant these systems will depend on its relative performance and cost, which remain to be seen orthogonal frequency division multiplexing (OFDM) is a multicarrier modulation technique with bandwidth-efficient signaling schemes for use in high data rate communication systems. This technique received a lot of attention especially in the field of wireless communication because of there robustness to the multi-path fading . The PAPR problem in the WiMAX systems using the potential capabilities in WiMAX standard as well as studying the well-known PAPR reduction techniques furthermore, the complexity evaluation and comparison between the existing approaches. . Many PAPR reduction techniques have been proposed in the literature, among which, partial transmit sequence (PTS) technique has been taken the considerable investigation. However, PTS technique requires an exhaustive search over all combinations of allowed phase

factors, whose complexity increases exponentially with the number of sub-blocks. In this paper, a newly suboptimal method based on modified artificial bee colony (ABC-PTS) algorithm is proposed to search the better combination of phase factors. The ABC-PTS algorithm can significantly reduce the computational complexity for larger PTS sub-blocks and offers lower PAPR at the same time. Simulation results show that the ABC-PTS algorithm is an efficient method to achieve significant PAPR reduction [9, 10]

This allows a more thorough analysis of the power adaptation to fade conditions for optimization of spectral efficiency. By considering the effect of error coding gain on power adaptation, a 7-state FSMC model for the implementation of the adaptive modulation and coding scheme in WiMAX is proposed. Filter bank technique comes with the evolution of many advantages over widespread OFDMA multicarrier scheme. It proposes many solutions for practical physical layer based on filter processing [11, 12]

6. CONCLUSIONS

The problem of PAPR is a serious intrinsic defect in all-optical OFDM systems, deteriorating nonlinear impairment in optical fibers. The peak-to-average power ratio (PAPR) theory in all-optical orthogonal frequency division multiplexing (OFDM) optical fiber communication systems.

Following are the calculated results:

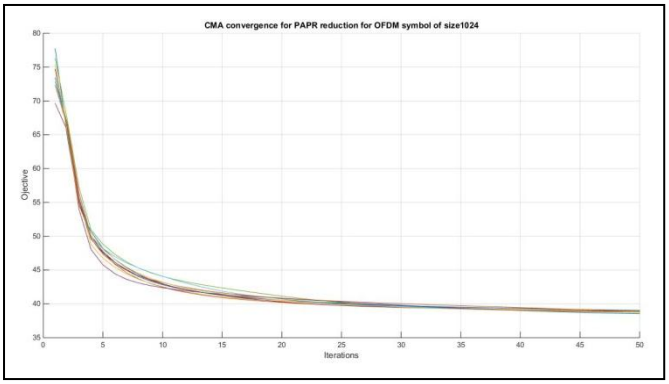

Chart -1: CMA Convergence for PAPR reduction

For convergence, the algorithm is initialized with the first iteration. The algorithm should run until the cost function converges. In practice convergence is fast and the algorithm is run for a fixed small number of iterations. To satisfy the power constraint, we can simply scale the result after convergence. A difference with the standard CMA is that, here, a good solution does not necessarily exist. The usual application of CMA is a linear combination of constant modulus sources for which, without noise, a perfect beam former exists. The present situation could be said to correspond to a very noisy source separation situation

In this simulation, Mt=2 transmit antenna. The simulations

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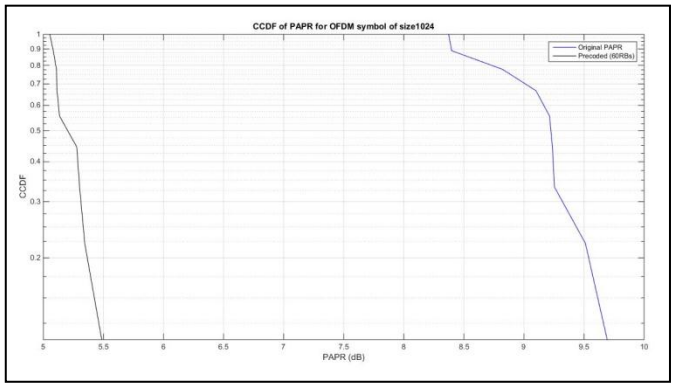

Chart -2: CCDF of PAPR

how that the proposed techniques attain a PAPR reduction of up to 5.5 dB.

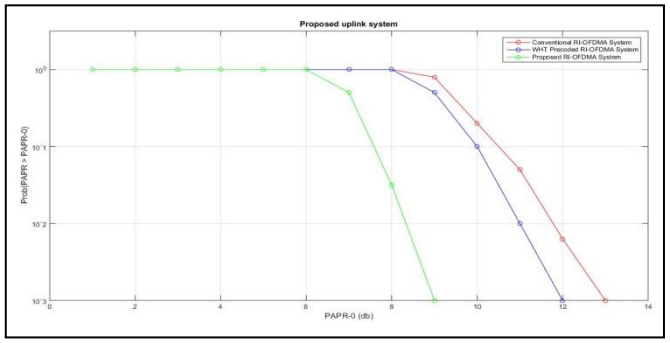

Chart -3: Proposed uplink system

CCDF based comparison of PAPR of the ZCMT, DHT and WHT pre-coding techniques in Interleaved OFDMA uplink system using 512-QAM. As in broadband services, WiMAX system is expected to deliver broadband access services to residential and enterprise customers in an economical way but due to interferences these experiences the negative effect of the high value of PAPR which is an intrinsic effect in all optical OFDM systems. Using Fast Fourier transform the value of PAPR is reduced and provides a better communication channel. Because for better services even in presence of distortion, it is an important thing to reduce the PAPR.

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