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PERFORMANCE ENHANCEMENT OF MULTICARRIER-CDMA WITH PAPR

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ABSTRACT

MC-CDMA is the multicarrier CDMA system which is the combination of CDMA and OFDM system.MC-CDMA is the latest wireless communication system used in mobile communication mainly. Because of the no of users the main drawback parameter is PAPR. This paper focus on review on signal distortion technique of PAPR reduction.

Keywords: *MC-CDMA, PAPR, OFDM, Clipping and Filtering,Companding*

I. INTRODUCTION

Multicarrier-CDMA is the combination of CDMA and OFDM system.its gives the benefits of both the system. In MC CDMA, data symbols of modulated bits are spread by spreading codes and then mapped into subcarriers of a MC-CDMA modem data symbol which is spread across frequency domain. it is high speed data transmission technique. It improves security, minimizes Inter symbol Interference (ISI). it is used in 3rd and 4th generation wireless communication system. MC-CDMA systems have the inherent problem of a high PAPR, which causes serious performance degradation in the transmitted signal. high PAPR gives in-band radiation (IBR) and out-of- band radiation (OBR). The IBR degrades the performance by increasing BER, but the OBR results in Adjacent Channel Interference (ACI).high PAPR degrades the overall performance of the system. Many techniques are used to reduced PAPR. this paper focus on some basic technique of reduction of PAPR.

PAPR:-Peak average power ratio(PAPR) is the ratio of maximum instantaneous power and average power of MCCDMA signal.

$$PAPR = \frac{\max[|p(t)|^2]}{E[|p(t)|^2]}$$

SIGNAL DISTORTION TECHNIQUE FOR PAPR REDUCTION:- which introduces distortion to signals and causes degradation in the performance including clipping, clipping and filtering, pre-distortion or companding. Signal pre-distortion techniques based on companding to reduce the PAPR. Different companding technique is μ-law companding and exponential companding.clipping and filtering is the also signal distortion technique for

reduce PAPR. When high PAPR signal passing through high pass amplifier(HPA) it gives in-band radiation and out-band radiation. The IBR degrades the performance by increasing BER, but the OBR results in Adjacent Channel Interference (ACI)

II. MC-CDMA TRANSMITTER

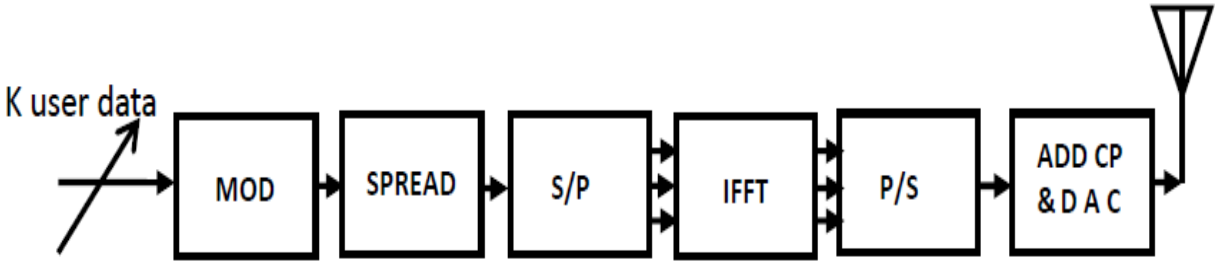

Fig.1 Mc-cdma Transmitter

This is the basic block diagram of MC-CDMA system. User data is given to the spreader. At Spreader the user data can spread at time domain by using spreading sequence. Then fed to serial to parallel converter and then Inverse Fast Fourier Transform (IFFT) in the frequency domain. MC CDMA uses Inverse Fast Fourier Transform (IFFT) to divide the bandwidth into orthogonal overlapping subcarriers. Each of the Nc subcarriers is modulated by a single chip. The data is converted back into serial data before cyclic prefix or guard interval is inserted. Finally the signal is fed to Digital to Analog converter for transmission (DAC).

III. MC-CDMA RECEIVER

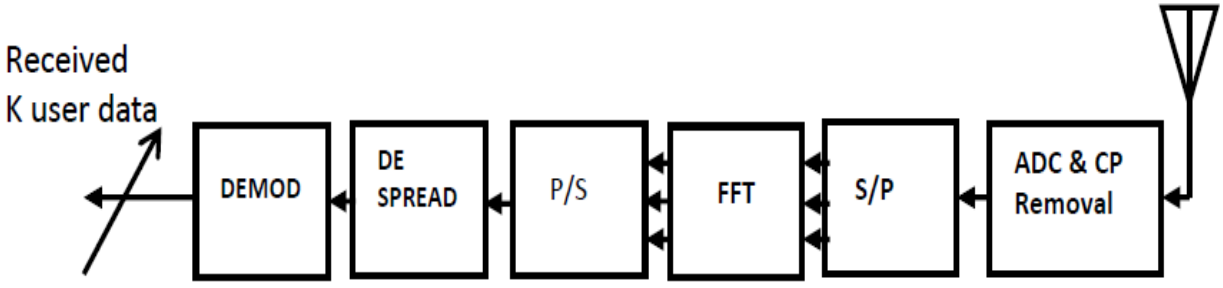

Fig.2 Mc-cdma Receiver

This is the block diagram of MC-CDMA receiver. The received signal is first down converted, And the cyclic prefix or guard interval is removed. Then, the data is fed to serial to parallel converter. After that, the signal is transformed using FFT and fed to dispreading and demodulation blocks.

IV. SPREADER IN MC-CDMA TRANSMITTER

In the MC-CDMA scheme, the same data symbol is transmitted in parallel (spread) over carriers, each multiplied by a different element of the spreading sequence and assigned to user . It is shown in Fig. Spreading sequences are binary sequence, which exibit noise-like properties. maximum length sequences, gold sequence and kasami sequences are well-known PN sequences. gold code sequence is most use in spreader. High data

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rate sequence(PN sequence) is combined with actually data signal. so actually data signal can be spread using this spreading sequence.

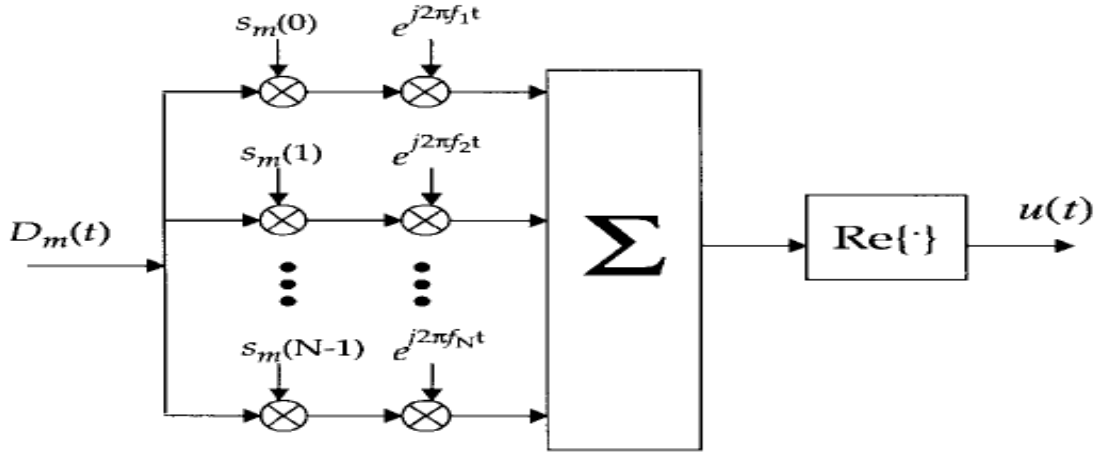

Fig.3 Spreader Mc-cdma Transmitter

V. DESPREADER IN MC-CDMA RECEIVER

At the despreader, the input signal is multiplied by the complex conjugate of the complex spreading waveform used in the transmitter and integrated over the data symbol. The block diagram of despreader is given below.

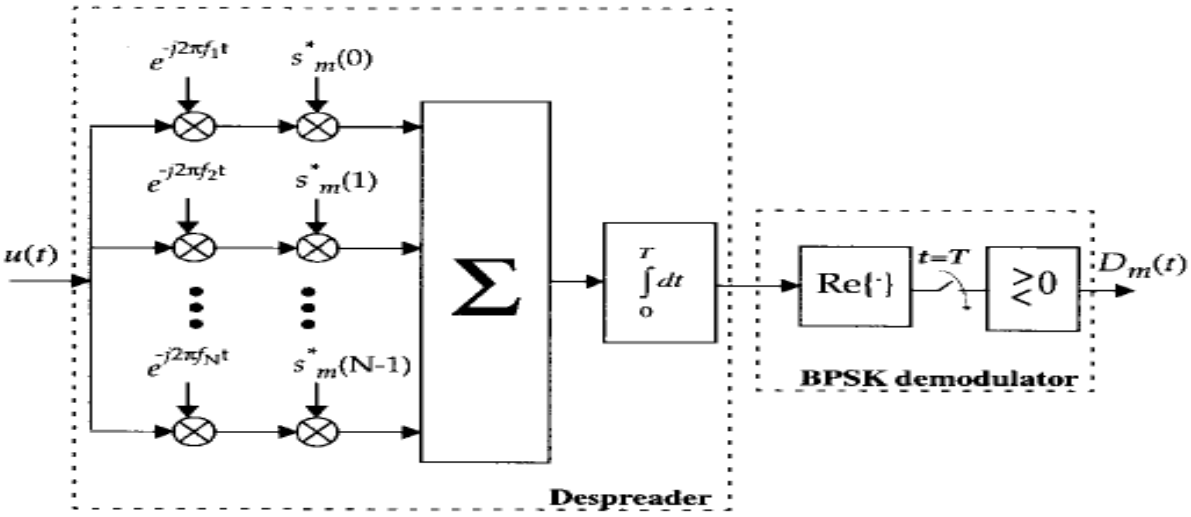

Fig.3 Despreader Mc-cdma Transmitter

In this, spreading sequence is applied directly to the identical parallel input bits. The spreading sequences in MC-CDMA separates other user's signal from the desire signal, providing that their spreading sequence are orthogonal to each other. orthogonal codes have zero cross-correlation. Orthogonal walse code and orthogonal gold codes are two well known codes.

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VI. SIGNAL DISTORTION TECHNIQUE FOR PAPR REDUCTION:-

CLIPPING AND FILTERING:-

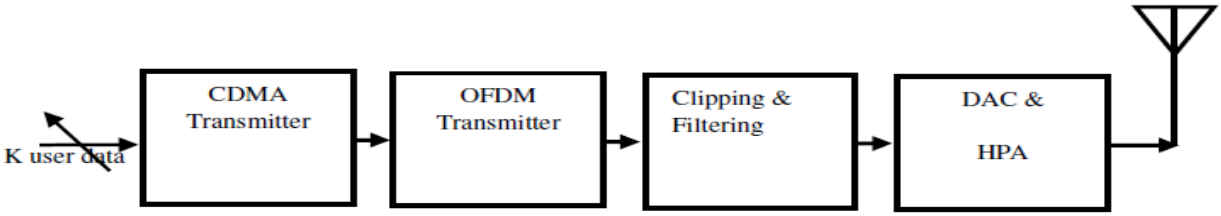

Fig.4 Clipping and Filtering

This is the block diagram of clipping and filtering for PAPR reduction. shows MC CDMA transmitter is combination of CDMA and OFDM transmitters. The MC CDMA transmitted signal is fed to Clipping followed by filtering then the signal is processed through DAC and HPA. Clipping is simple and effective by selecting optimum clipping ratio to remove the high amplitude peaks. But, it degrades system performance by introducing IBR and OBR, which can be reduced by filtering. This technique results in peak regrowth and distortion of the transmitted signal that can be reduced by repeated clipping and filtering. This is the simple technique.

CCDF of the PAPR

The Complementary Cumulative distribution (CCDF) of the PAPR is one of the most regularly used parameter for measuring the performance of the MC CDMA system. The CCDF of the PAPR represents the probability that the PAPR of a data block exceeds a given threshold.

The CCDF of the PAPR of a data block with Nyquist rate sampling is given as,

$$P(PAPR>Z) = 1-P(PAPR<=Z)$$

$$= 1-F(Z)\,N_c$$

$$= 1-(1-\exp(-Z))\,N$$

VII. SIMULATION RESULTS

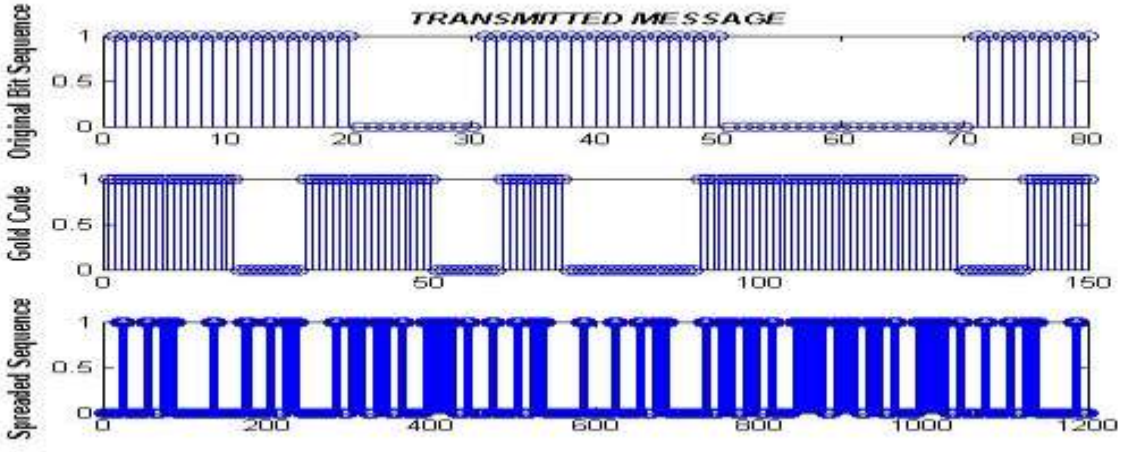

Fig.5 Simulation Result of Transmitter

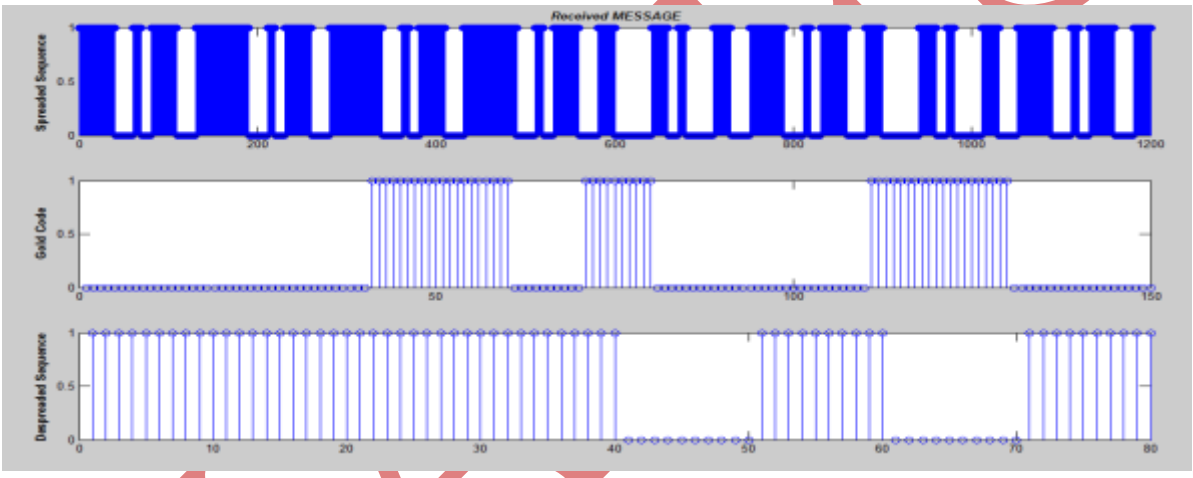

Fig.6 Simulation Result of Receiver

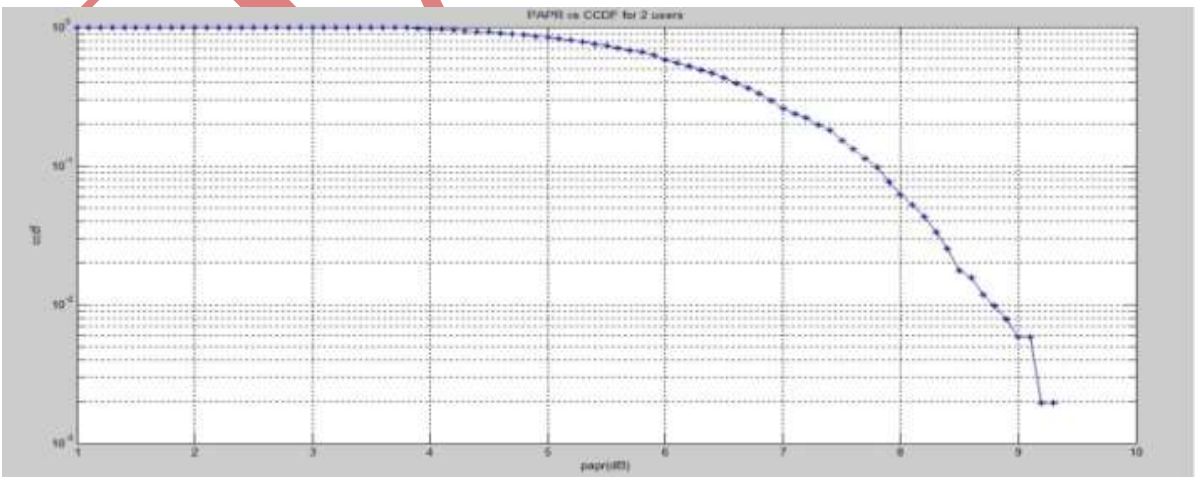

Fig.7 Simulation Result of PAPR vs. CCDF for 2 Users

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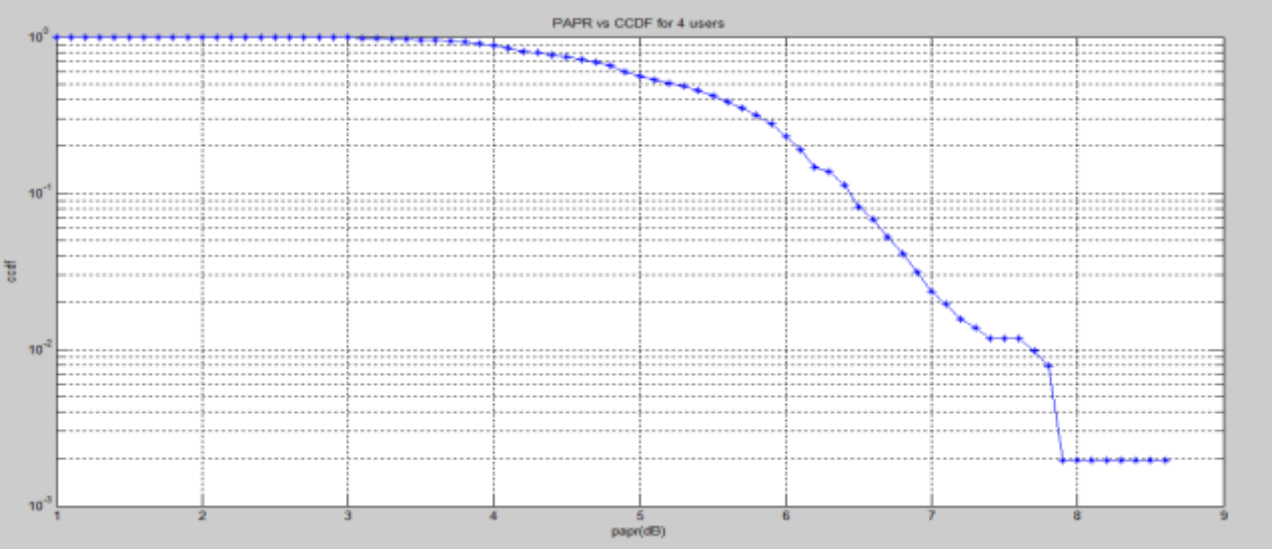

Fig.8 Simulation Result of PAPR vs. CCDF for 4 Users

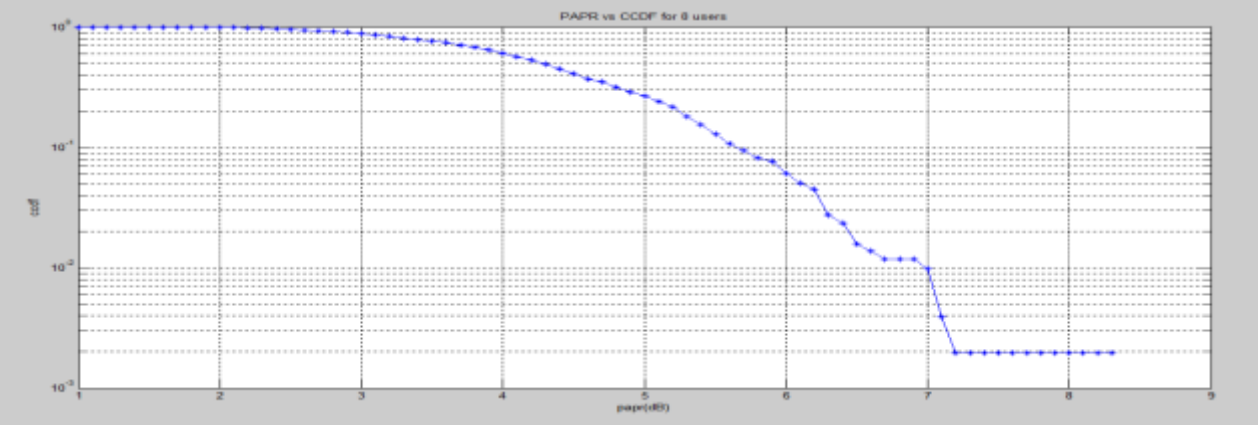

Fig.9 Simulation Result of PAPR vs. CCDF for 8 Users

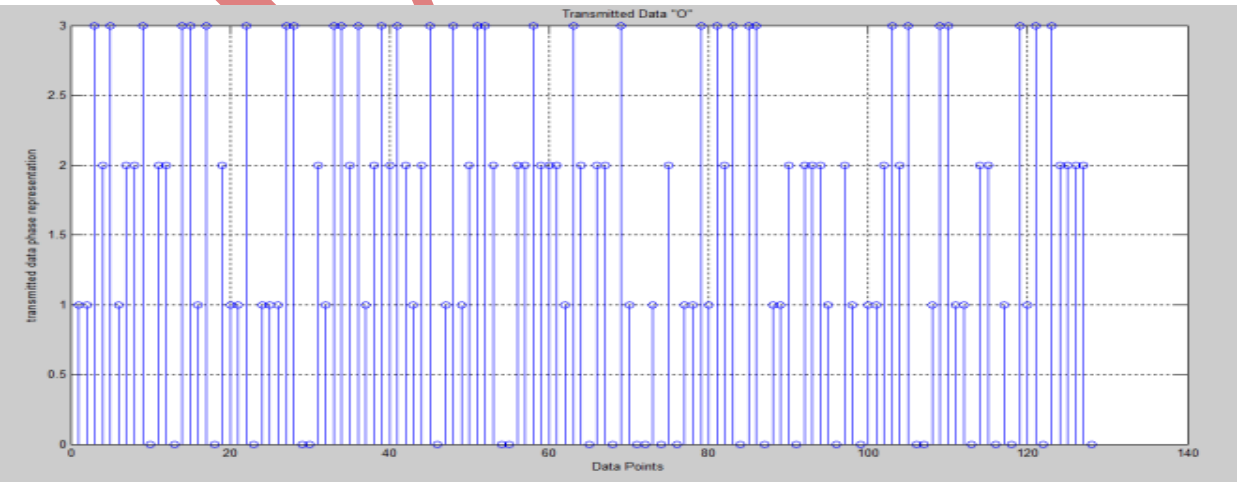

Fig.10 Transmitted Data in clipping and filtering method

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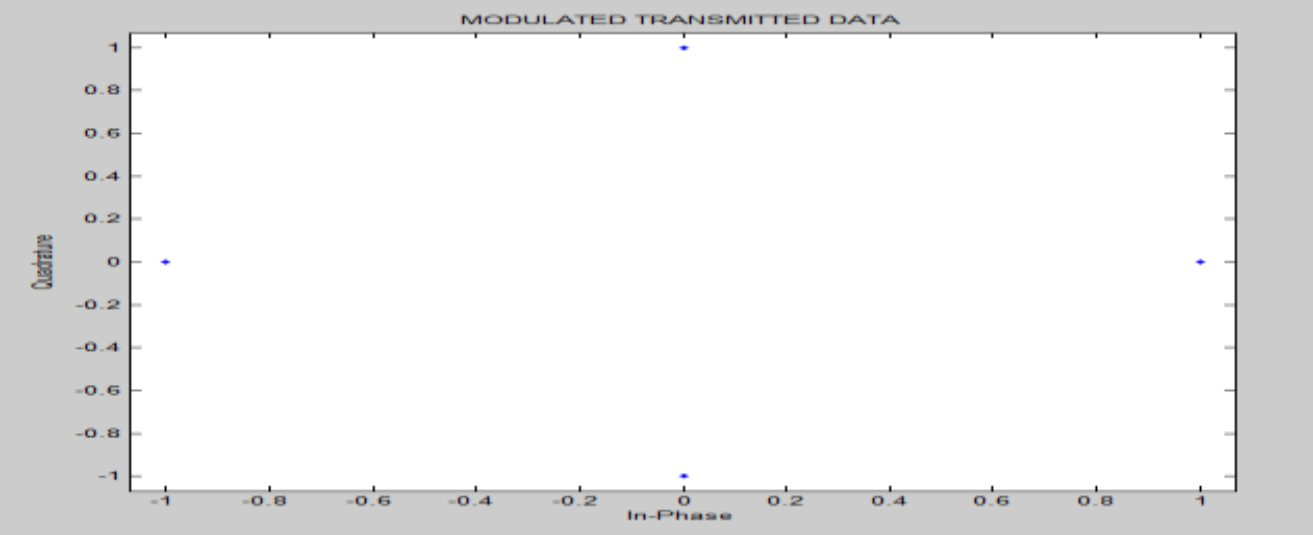

Fig.11 Modulated Data in clipping and filtering method

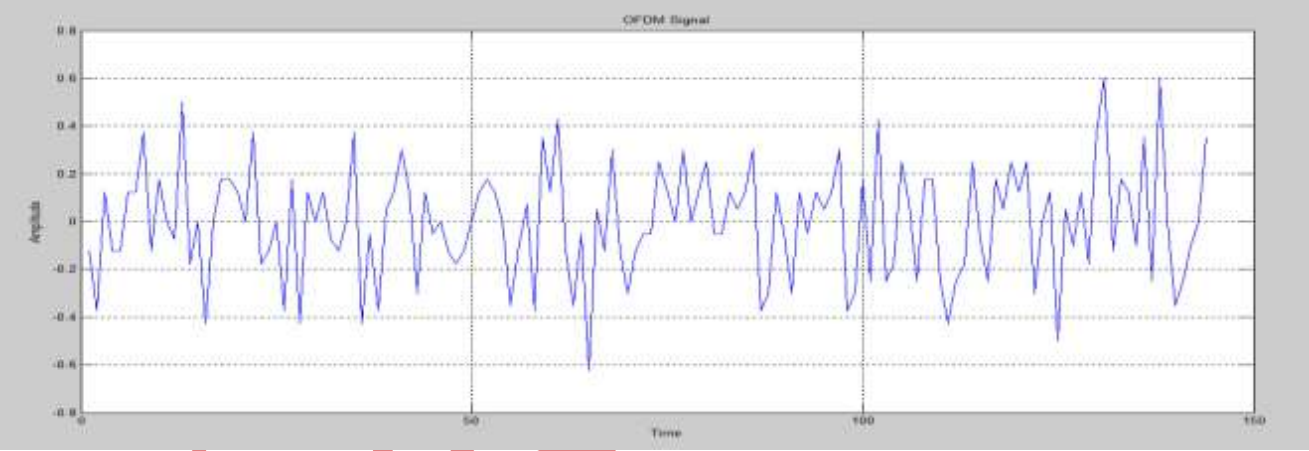

Fig.12 OFDM signal in clipping and filtering method

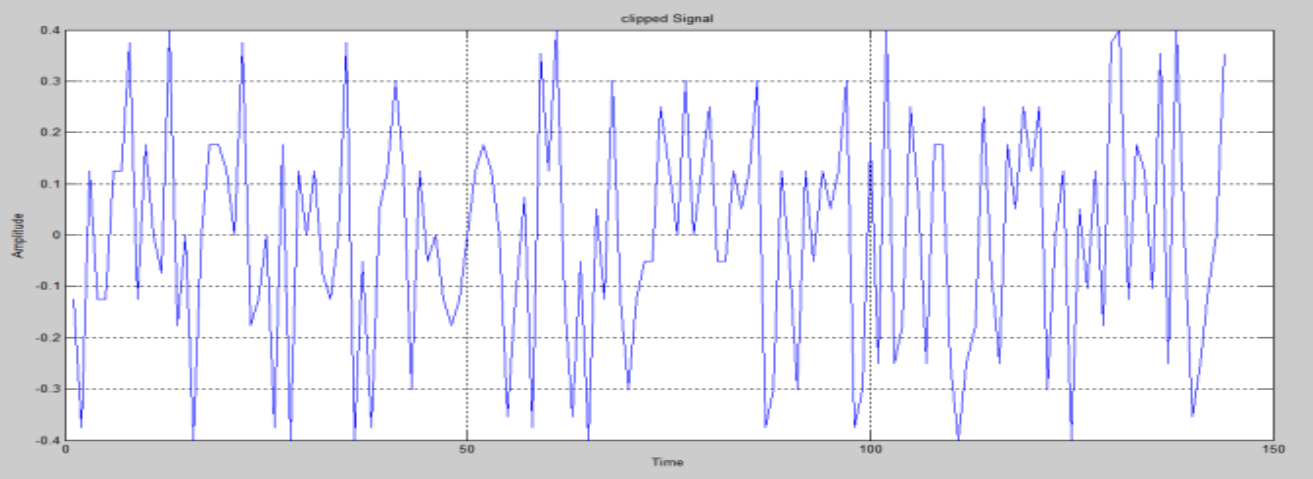

Fig.13 Clipped signal in clipping and filtering method

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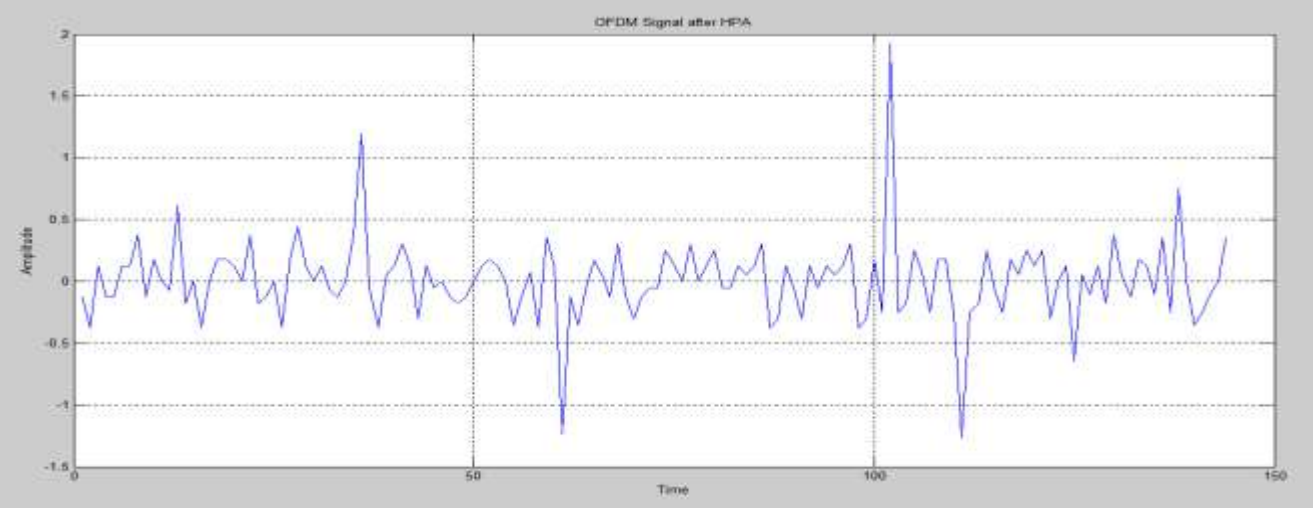

Fig.14 OFDM signal after HPA in clipping and filtering method

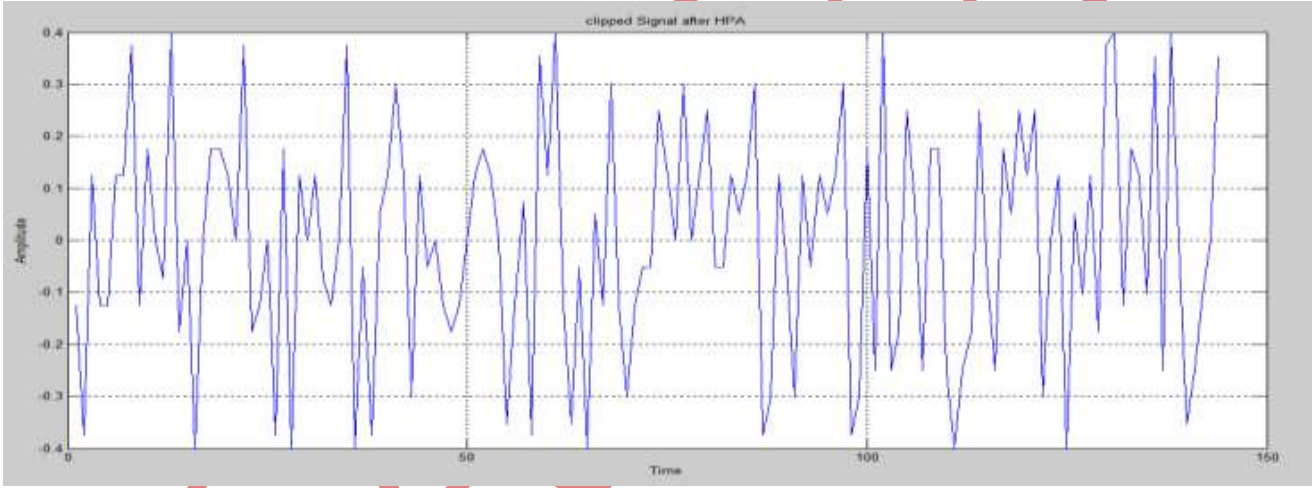

Fig.15 Clipped signal after HPA in clipping and filtering method

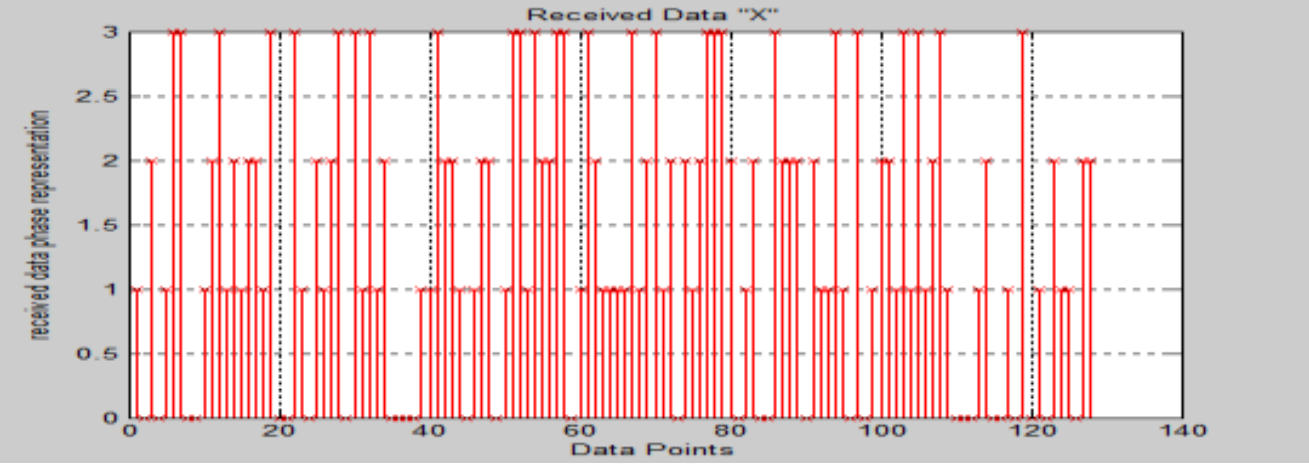

Fig.16 Received signal in clipping and filtering method

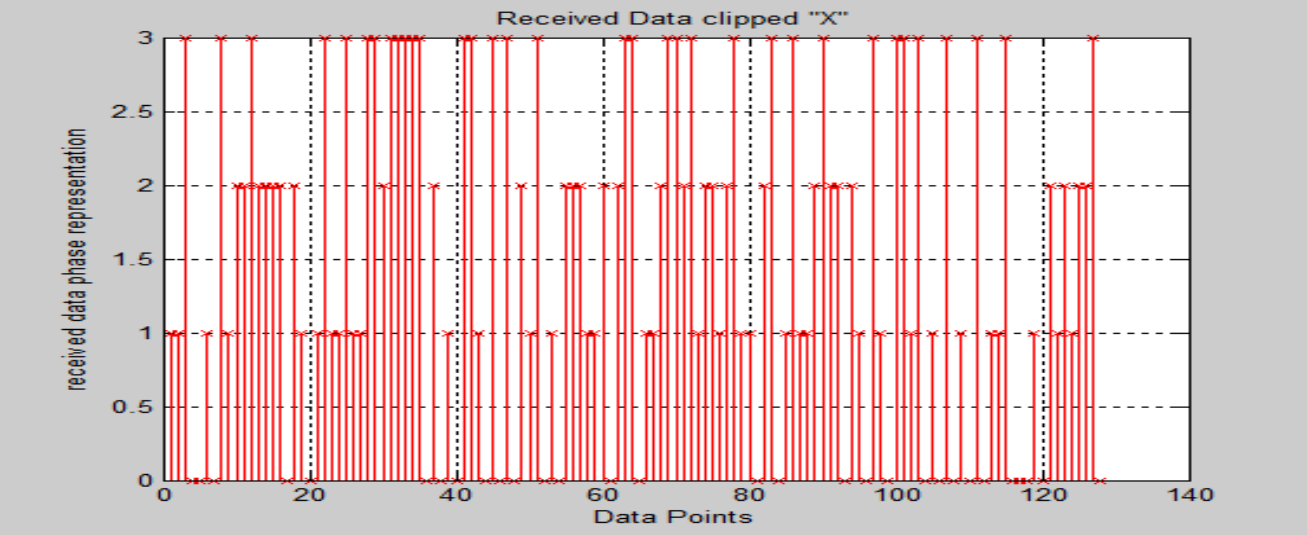

Fig.17 Received clipped data in clipping and filtering method

VIII. CONCLUSION AND FUTURE WORK

From result of simulation in MATLAB, by increase the number of users reduced PAPR and CCDF is decrease in MC-CDMA System. So, Performance of MC-CDMA is decreased when the number of user increased.Further in that we will first analyze the different signal distortion technique used for PAPR reduction method. Get the best result in PAPR reduction.

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