ABSTRACT

Multicarrier Code-Division Multiple Access (MC-CDMA) is a transmission technique which combines the advantages of both OFDM and Code-Division Multiplexing Access (CDMA) to allow high transmission rates over severe time-dispersive multi-path channels without the need of a complex receiver implementation. MC-CDMA exploits frequency diversity via the different subcarriers, and therefore allows the high code rate systems to achieve good Bit Error Rate (BER) performances.

The foremost limitation of MC-CDMA system is the Multiple Access Interference (MAI) and high peak to average power ratio (PAPR). High PAPR leads to nonlinear distortion of the amplifier and results in inter-carrier interference and out-of-band radiation. The simplest method for PAPR reduction is clipping. Clipping at the Nyquist sampling rate has been used for low complexity applications but suffers from peak regrowth after digital-to-analog (D/A) conversion. Clipping of the oversampled MC-CDMA signals reduces the peak regrowth after D/A conversion. But, it causes out-of-band radiation which has to be filtered. Also clipping of MC-CDMA signals causes clipping noise which has sparsity in time domain. The performance of MC-CDMA under such scenario is poor and optimal detection is one of the solutions with a high complexity is required. In this thesis the Bit Error Rate (BER) performance is compared under clipping noise with sphere decoding.
and Global search algorithm based Multiuser detectors. The detector for the
MC-CDMA can be of two types, namely Single-User detector and Multi-User
detector. The Single-User detector is usually a suboptimal detector having an
equalizer and quantizer combination. The Multi-User detection can be of
optimal or suboptimal.

In this thesis, we analyze the causes of clipping noise and problems
due to clipping noise in the MC-CDMA signal. The clipping noise variations
with various modulation schemes are also investigated. The Bit error rate
(BER) in Additive white Gaussian noise (AWGN) channel, Rayleigh channel
and Rician channel with and without clipping noise is computed. As an
innovation Global search algorithm based multiuser detector with MLSE is
employed for determination of clipping noise and hence to suppress it. The
simulations have been clearly shown that the Global Search algorithm
multiuser detector is a suitable candidate for the clipping noise problem
compared to the Sphere decoding and Genetic algorithm based multiuser
detectors.

In this thesis the following studies have been made.

- The performance analysis of MC-CDMA system with
clipping noise and without clipping noise has been done in
terms of Bit error rate and signal to noise ratio.
The performance of MC-CDMA system with clipping noise and without clipping noise using Genetic algorithm and Global search algorithm based MUD’s has been analyzed.

The performance of MC-CDMA system under clipping noise in AWGN, Rayleigh fading and Rician fading channel using Global Search algorithm based Multi User Detector is analyzed. By simulation result, BER in AWGN channel outperforms other channels as SNR is increased.