Analysis on CPFSK Modulation Technique for Wideband Code Division Multiple Access

Miss. Mamta pandey, Miss. Megha kimothi, Mr. Sumit Joshi

***Abstract*— This paper is the study of the CPFSK (Continuous phase frequency shift keying) modulation technique using AWGN (Additive White Gaussian Noise) & Multipath Rayleigh fading channels. WCDMA systems are based on higher modulation. Which provide transmission at higher data rates. There are a number of factor that enter into the choice of a modulation scheme for use in a wireless application. In this we studied the scatter plot, eye diagram & signal trajectory of CPFSK system.**

***Index Terms*— CPFSK, WCDMA, AWGN, Rayleigh Fading, Scatter Plot, Signal Trajectory, Eye Diagram.**

I. Introduction

In WCDMA system, high data rate signal transmission is used which enable multimedia rich applications such as video streams and high resolution pictures to the users. Therefore in WCDMA suitable modulation technique and error correction mechanism are required. CPFSK has a higher quality bit error performance than traditional binary FSK for a given signal to noise ratio. Continuous phase frequency shift keying (CPFSK) is a commonly used variation of frequency shift keying (FSK) ,which is itself a special case of analog modulation. FSK is a method of modulating digital data onto a sinusoidal carrier wave, encoding the information present in the data to variations in the carrier's instantaneous frequency between one of two frequencies. In, general a standard FSK signal does not have a continuous phase, as the modulated waveform switches instantaneously between two sinusoids with different frequencies. MSK (minimum shift keying) is a type of continuous phase frequency shift keying that is used in a number of applications. The main attribute of MSK are constant envelope, spectral efficiency, error rate performance of binary PSK and self synchronizing capability. In this paper we use MSK modulation technique in WCDMA system.

II. SYSTEM MODEL

In cellular communication system, different channel qualities are used for different users in terms of SNR due to the difference in distance between various base station, fading and interference. To obtain optimal bit rate for all the channel qualities link quality control is used as it adapts the data protection according to the channel quality, the system adopts AMC. WCDMA system user's higher modulation technique to increase the transmission data rate.

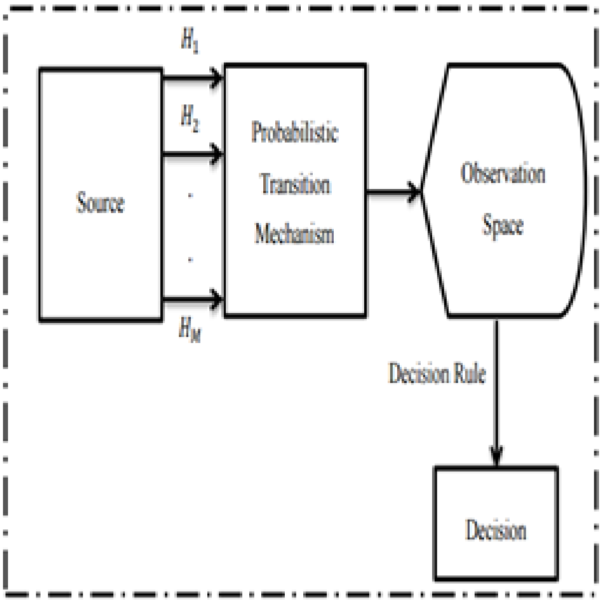

Figure 1

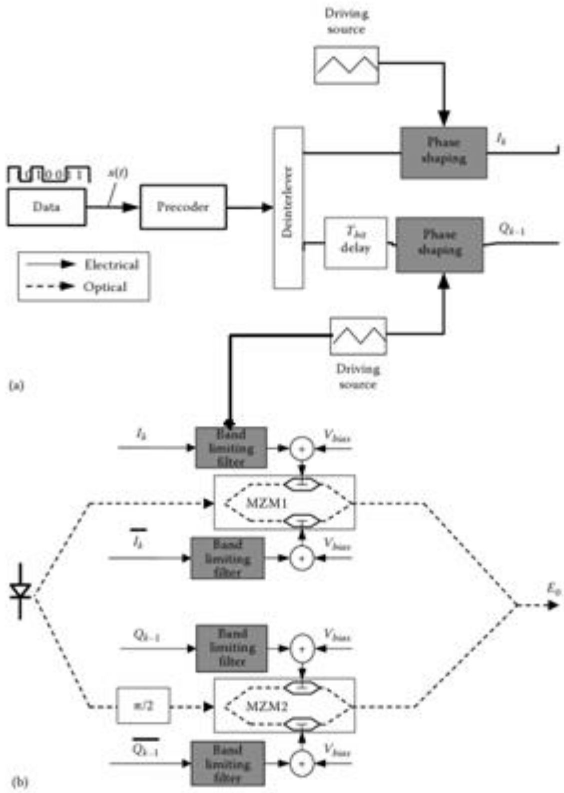

Figure 2

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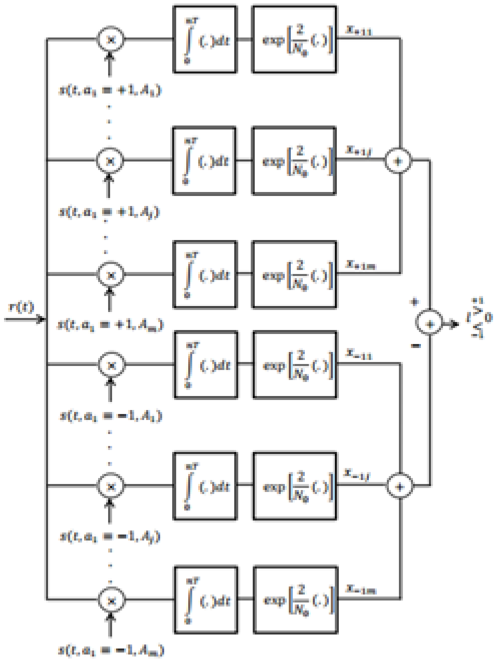


Figure 3

A. *Digital Modulation Technique*

In digital modulation techniques, an analog carrier is modulated by a binary code. The digital modulator device acts an interface between the transmitter and the channel. The digital modulation schemes can be categorized basically either on the basis of their detection characteristics or in terms of their bandwidth compaction characteristics. The basic criteria for best modulation scheme depends on bit error rate(BER), signal to noise ratio(SNR), available bandwidth, power efficiency, better quality of service, cost effectiveness. The performance of each modulation scheme is measured by estimating its probability of error with an assumption that system are operating with Additive White Gaussian Noise. Modulation methods which are capable of transmitting more bits per symbol are more immune to error caused by noise and interference induced in the channel. The delay distortion can be an important measure while deciding modulation scheme for digital radio.

Many digital modulation techniques are used in modern wireless communication systems and many more are sure to be introduced. Some of these techniques have suitable differences between one another and each technique belongs to a family of related modulation methods. Continuous phase frequency shift keying (CPFSK) modulation is one of the more attractive schemes for its good spectral properties.

B. *AWGN Channel*

In this channel model the only impairment to communication is linear addition of white noise having a constant spectral density with a Gaussian distribution of amplitude. In AWGN the noise is additive and is commonly used to transmit signals.

C. *Rayleigh Fading Channel*

It is a model for the effect of a propagation environment on a radio signal i.e. used by wireless device. These models assume that magnitude of that is travelled through this medium will vary randomly or fade according to a Rayleigh distribution of the radial component of the sum of two uncorrelated Gaussian random variables.

III. PERFORMANCE CHARACTERISTICS

A. *Eye Diagram*

It is obtained from the discrete time eye diagram scope that displays the multiple traces of a modulated signal that we use to analyze the modulation characteristics. These are pulse shaping or the characteristics as channel distortion of the various signals.

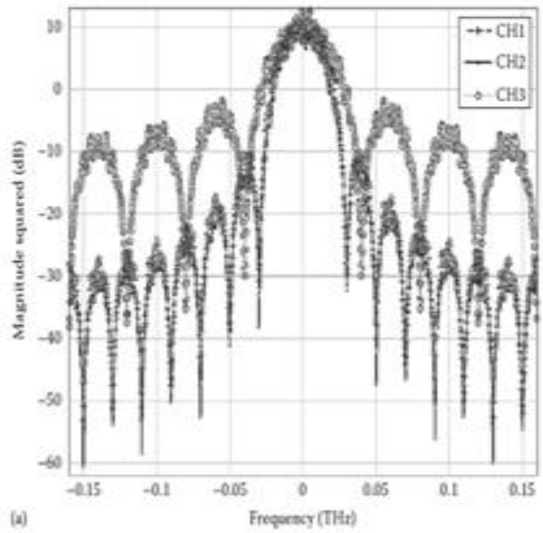


Figure 4

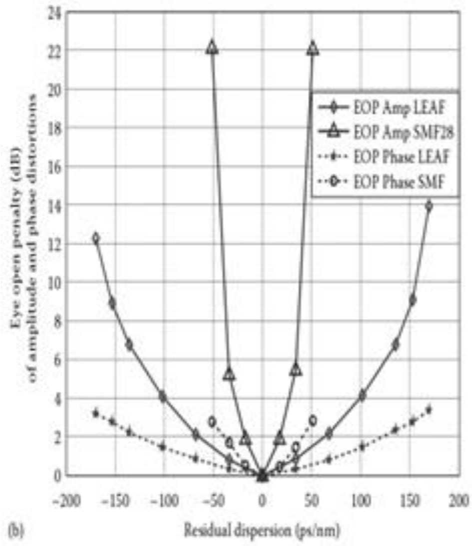


Figure 5

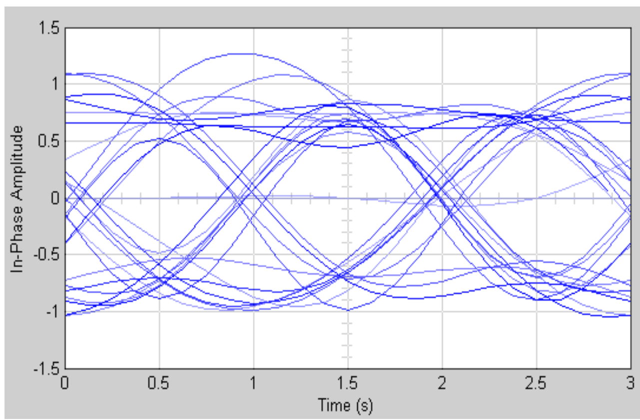


Figure 6

IV. RESULTS

The results are discussed below

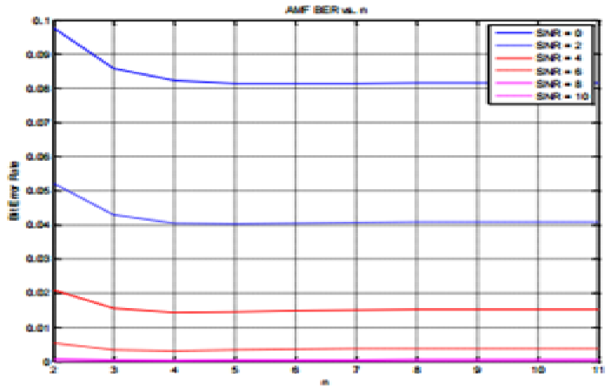


Figure 3.5: CPFSK AMF BER vs. n

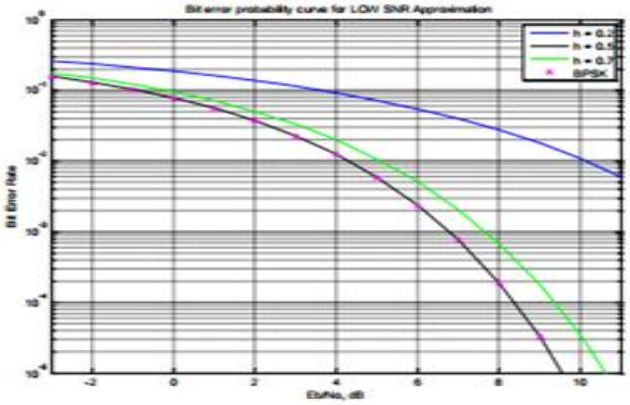


Figure 3.6: CPFSK AMF BER vs SNR for Different h

Figure 7

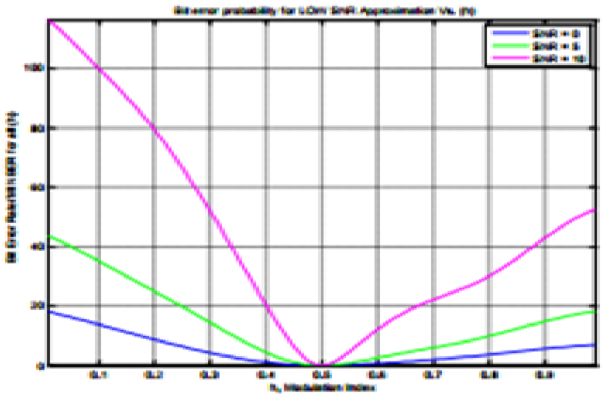


Figure 3.7: CPFSK AMF BER vs. h for Different SNR

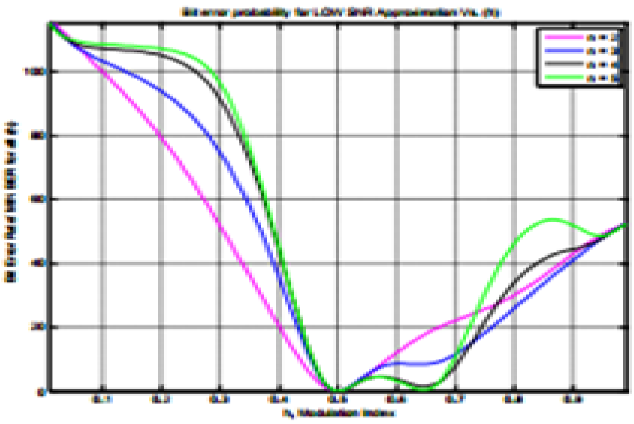
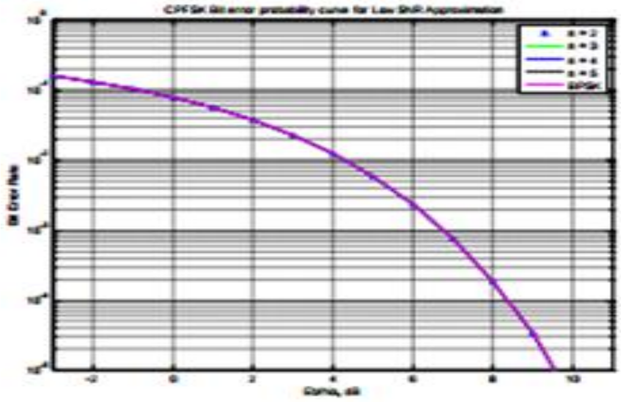
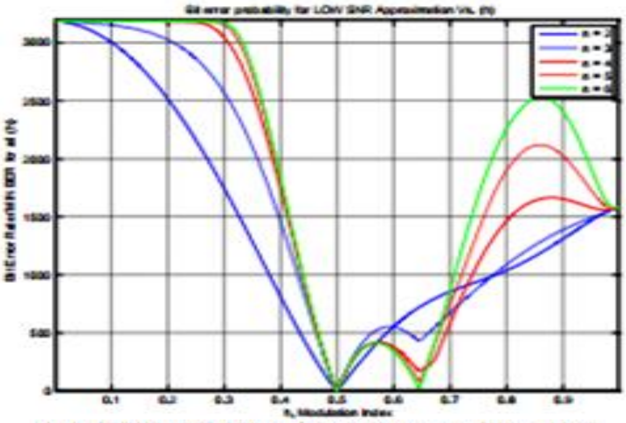


Figure 3.8: CPFSK AMF BER vs. h for Different n at $SNR = 6$ dB

Figure 8



re 3.9: CPFSK AMF BER vs. SNR for Different n at $h = 0.5$



e 3.10: CPFSK AMF BER vs. h for Different n at $SNR = 12$ dB

Figure 9

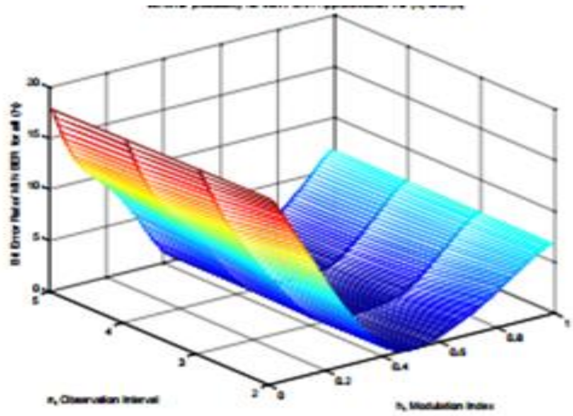


Figure 3.11: 3D Graph for CPFSK AMF BER vs. h and n, $SNR = 0$ dB

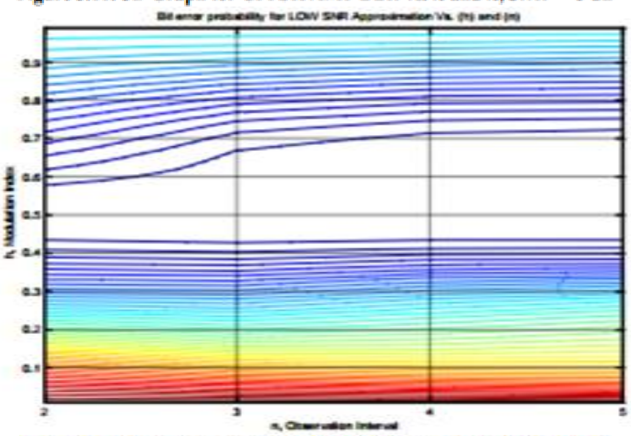


Figure 3.12: Contours of CPFSK AMF BER vs. h and n, $SNR = 0$ dB

Figure 10

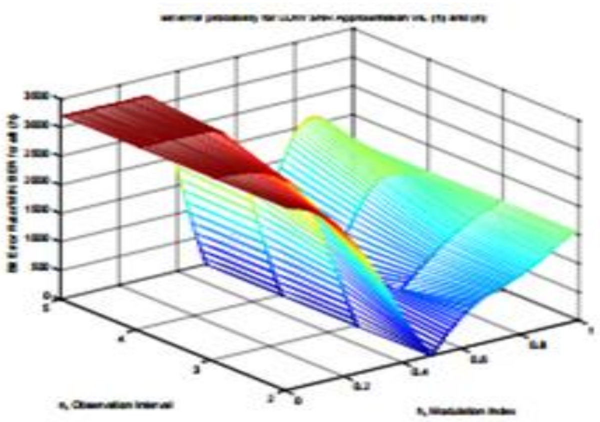


Figure 3.13: 3D Graph for CPFSK AMF *BER* vs. *h* and *n*, *SNR* = 12 dB

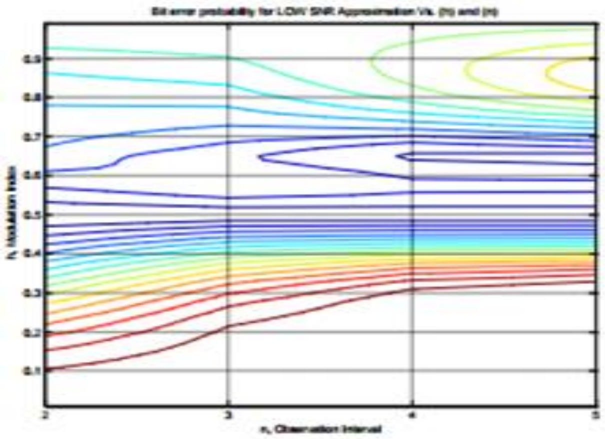


Figure 3.14: Contours of CPFSK AMF *BER* vs. *h* and *n*, *SNR* = 12 dB

Figure 10

V. CONCLUSION

This research has been focused on the analysis and performance evaluation of CPFSK modulation scheme for WCDMA system under AWGN and multipath Rayleigh fading channel. CPFSK techniques are more bandwidth efficient and have better power efficiency. So these have the less BER.

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