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MULTI-CARRIER CODE DIVISION MULTIPLE ACCESS (CDMA): AN OVERVIEW

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Abstract

This paper offers a summary of the development of a modern multiple access technique called the Multicarrier Code Division Multiple Access (MC-CDMA). We look at the basic techniques of frequency division multiple access (FDMA) and time division multiple access (TDMA) and describe the two orthogonal frequency division multiplexing (OFDM) and direct sequence CDMA (DS-CDMA) schemes, which contributed to the merger of MC-CDMA. Finally, a contrast is made between the three proposed MC-CDMA techniques and their predecessor DS-CDMA, and the MC-CDMA dominance is seen when serving multiple users via the Bit Error Rate (BER) Vs Signal to Noise Ratio (SNR) simulation graphs for MC-CDMA and OS-CDMA.

Keywords: *Bit Error Rate (BER), Multicarrier Code Division Multiple Access (MC-CDMA), Code Division Multiple Access (CDMA), Signal to Noise Ratio (SNR).*

I. INTRODUCTION

To allow several simultaneous users to use the same fixed bandwidth radio spectrum, multiple access schemes are used. The bandwidth which is assigned to it is always restricted in any radio system. To increase the user capacity of any wireless network, sharing of the spectrum is necessary[1]. Multiple Access Frequency Division (FDMA), Multiple Access Time Division (TDMA) and Multiple Access Code Division (COMA) were the three prevalent ways of sharing the available bandwidth with multiple wireless device users[2].

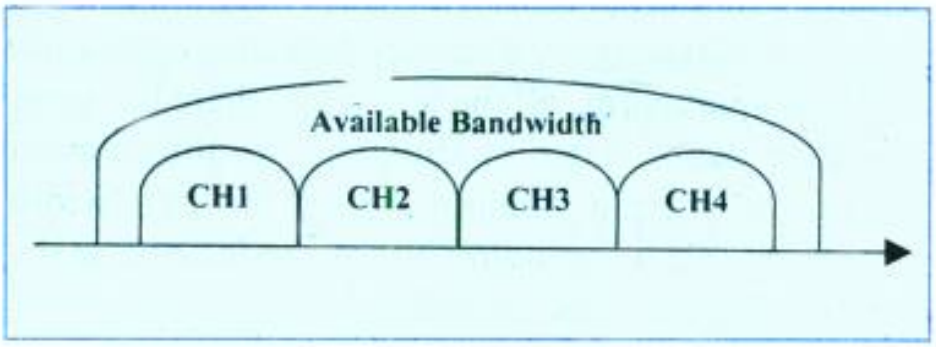

Fig. 1 Bandwidth division into narrower band channels in FDMA[3].

Active research has given rise to many extensions and hybrid approaches based on these methods for schemes that can handle a large number of users. These include Multiplexing of the Orthogonal Frequency Division (OFDM), hybrid TDMA and FDMA systems, and COMA multi-carrier systems[4]. This paper presents an overview of the evolution of the recently proposed multi carrier modulation technique called the Multicarrier Code Division Multiple Access (MCCDMA) method, built through the merger of OFDM and COMA. (CDMA is a spread spectrum technique that uses neither frequency channels nor time slots[5].

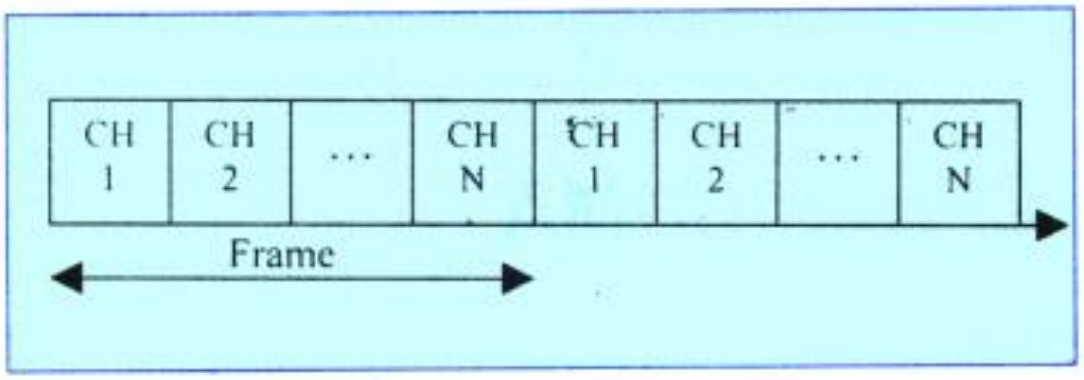

Fig. 2 TDMA scheme where every user is assigned small time[3].

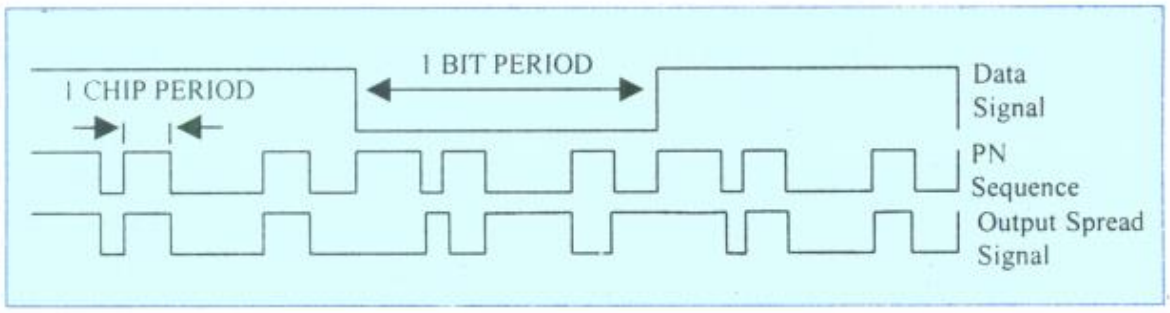

Fig. 3 Multiplication of data with PN sequences to originate Direct Sequence Spread Spectrum (DS-SS)[3].

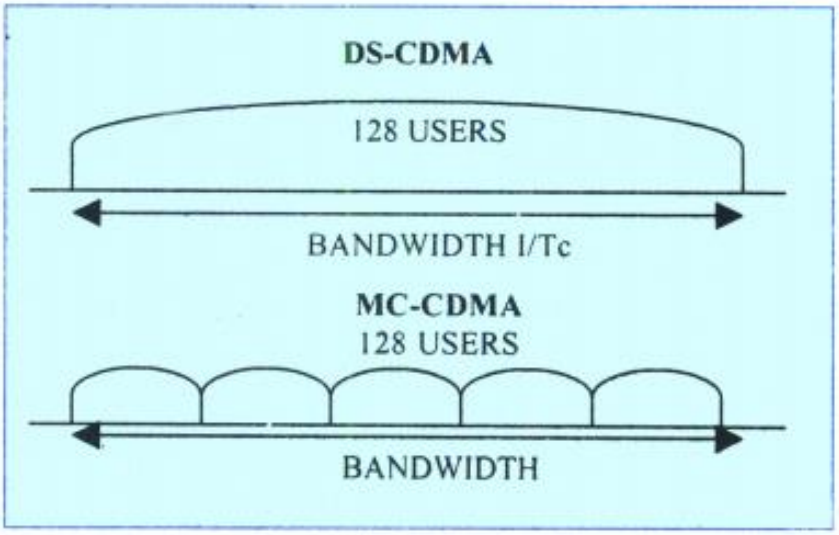

Fig. 4 Illustrates bandwidth allocation in Direct Sequence Spread Spectrum[3].

Direct Spread (DS) CDMA is a spread spectrum technique that broadcasts the signal belonging to all the users simultaneously over the designated bandwidth. In another words, all the users will share the same frequency band. After modulating the information bits to the pseudo random noise, the bandwidth occupied by the information bits expands because the smaller chip periods contribute to its expansion[6].

II. LITERATURE REVIEW

A study on frequency-domain oversampling for cognitive CDMA systems was conducted by Hu et al. that allowing robust and massive multiple access to the Internet of Things. Numerous sensors and systems are being introduced and interconnected in the age of the mobile internet and the Internet of Things (IoT). Traditional wireless networking systems face difficulties in accommodating this amount of data traffic, both in terms of increasingly limited spectrum resources and vast multiple access. In this paper, multiple access cognitive code division (Cognitive-CDMA) is suggested by combining the notion of cognitive radio with complex non-continuous spectrum bands and multiple access code division[7].

III.DISCUSSION AND CONCLUSION

Multi-carrier multiple access code-division (MC-CDMA) incorporates the multi-carrier transmission technique known as orthogonal multiplexing of frequency-division (OFDM) with multiple access code-division (CDMA). In digital audio and video broadcasting, and more recently in wireless local area networks (Wireless LANs), as well as in fixed wireless broadband connectivity, the first was prominent. In mobile cellular systems, the second one is especially common.

There are some fascinating characteristics in both OFDM and CDMA, and MC-CDMA aims to merge them. We have provided a detailed overview of MC-CDMA and defined from a unified context various variants of this multiple access technique. We have explained that the issue of detection in orthogonal MC-CDMA is solely a problem of channel equalisation, and that diversity-based combination detectors are clearly inadequate for this purpose. In multi carrier transmission, we have also briefly addressed the relative merits of various multiple access techniques. The need and theory for a new spread spectrum technique in this article, i.e. Multicarrier COMA was introduced and the three kinds of techniques of Multicarrier COMA were presented. For the OS-COMA scheme and the MC-COMA method, the bit error rate for a Rayleigh fading dispersive channel was compared.

IV. REFERENCES

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