

DESIGN AND IMPLEMENTATION OF A CDMA SYSTEM FOR MULTIUSER COMMUNICATION

Abstract

This poster express DSSS CDMA system. It also shows the behaviors of the CDMA system under noise and interferences. Firstly looking in the theoretical expressions and implement it using MatLab program to have an overview of bit error rate as a function of signal to noise-interference ration. Using MatLab codes to simulate multiusers m-sequence CDMA system and collect its BER vs. SNIR. Simulation results match the theoretical values. At last this paper shows implementation of CDMA system using EMONA TIMS 301c setting.

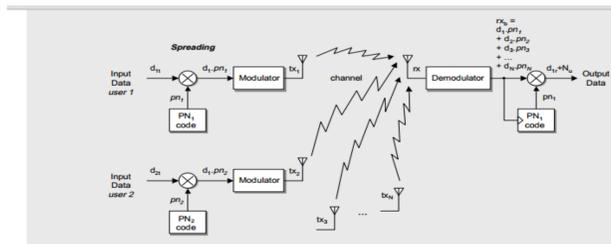
Introduction

The first users of spread spectrum technologies (SS), were the military and intelligence communities to solve challenges of interception and jamming. Spread Spectrum aim to expand each user signal to take a much wider spectrum than necessary.

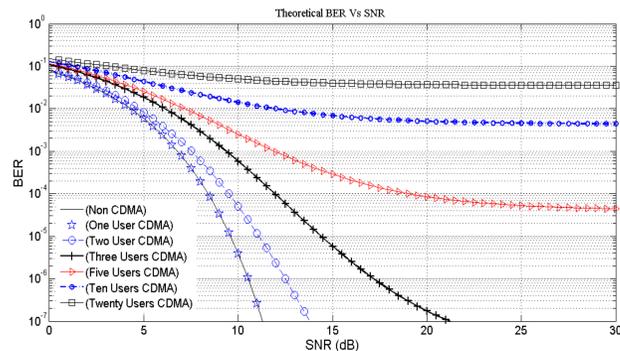
Spread Spectrum (SS) has many advantages. It prevents different kinds of noise and multipath distortion and used to hide and encrypt signals. As well as it allows to many users independently use the same higher bandwidth with very small interference.

CDMA allow all users transmit at the same time and the same channel but with different spreading codes. Each user can use the entire available frequency spectrum for transmission. In CDMA, each user has its own PN code and uses the same RF bandwidth. A CDMA can transmit simultaneously, asynchronous or synchronous. The quality of CDMA decreases with an increasing number of users.

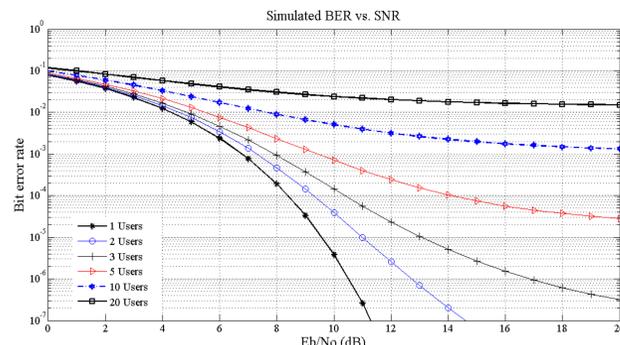
CDMA System



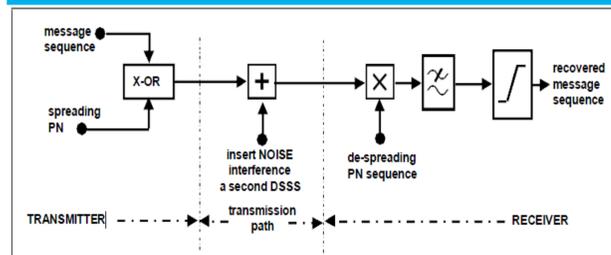
MatLab results of the theoretical BER Vs SNR



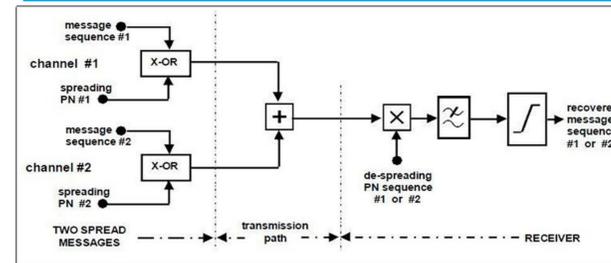
simulation for CDMA system



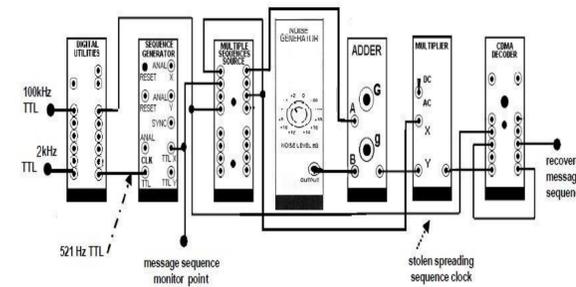
Basic CDMA system for one users



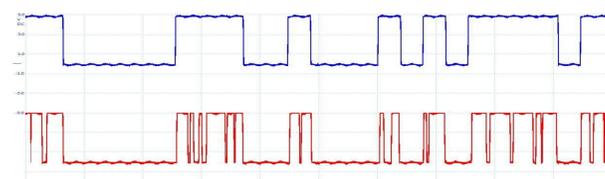
Basic CDMA system for two users



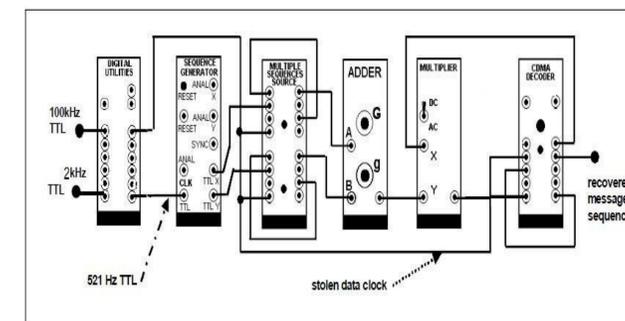
Hardware Implementation for one user



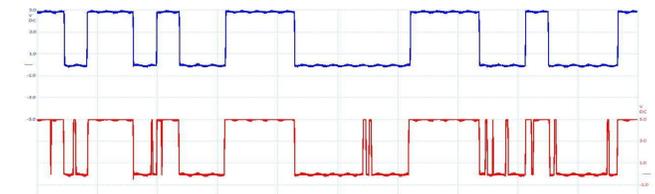
The original and recovered signal for one user with noise



Hardware Implementation for two users



The NEAR-FAR Problem effect on the received signal



The CDMA Setups on TIMS



Conclusion

This project was mainly discussing the BER vs. SNIR. It has been shown that as E_b/N_0 increases the probability of error occurring get less for single CDMA user but in case of multiusers the main effect of SNIR over BER is the interference between sequences. Which makes BER saturate as SNIR increases. As the number of users increase makes BER saturate faster at high value. And that match the theory of BER vs. SNIR. In practical implementation they alues approach the theoretical ones. That difference because of the distortion that occur in the wires and the EMONA TIMS 301c modules. The near-far problem affects BER more that noise or the interference of signals with the same power.