

**INVESTIGATION OF MULTIUSER DETECTION
ALGORITHM FOR A SPACE TIME CODED MC-CDMA
SYSTEM**

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Abstract

Some of the critical and crucial barriers identified in the air interface of multiuser communication systems are multiuser detection, channel capacity and channel stability. These barriers are so significant and pivotal that the development has been solely obstructed by them in wireless sectors such as cellular mobile, wireless LANs and satellite communication systems.

Space Time Trellis Coding is one of the prominent multiple-input multiple-output channel concepts which has been proposed for high data rate communication systems. This gives space diversity, temporal diversity and coding advantage, making the communication channel much more stable.

MC-CDMA is a multiple access communication system designed to be operated in a multiuser environment, having the advantage of subcarrier frequency diversity. In this system, signal transmission and reception is based on the Fast Fourier Transform technique similar to the well known OFDM technology.

This research is a combination of the above mentioned technologies. First the performance evaluation is done for a Space Time Trellis Coded (STTC) Frequency Domain Spreading Assisted Multicarrier COMA (FDSA MC-CDMA) system with a single user. Then it presents a multiuser detection scheme based on combining techniques that can be applied to a STTC FDSA MC-CDMA system, operated in a frequency selective slow fading channel. In the case of multiuser detection, for the purpose of better symbol recovery, multiple numbers of spreading codes are employed for a single user. One of the main combining techniques, namely Equal Gain Combining(EGC) is selected and tested as an example showing that the proposed detection scheme can be used or tested with any of the spreading code aided multiuser detection mechanisms.

In addition to the initial detection, iterative based or multistage Parallel Interference Cancellation (PIC) is used to improve the performance of the receiver to indicate, how far this method is compatible with the existing receiver technologies. It gives clear evidence to the fact that the signal recovery can be further improved. Simulation results show the performance of the system, when it is operated with single, 2, 4, 8 and 16 users with iterations for the PIC.