# EFFECTS OF IMPERFECT POWER CONTROL, FREQUENCY &TIMING OFFSET ON LS-DRMTA AND LS-DRMTCMA ALGORITHMS.

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## Abstract

The CDMA and smart antennas are two promising approaches to increase system capacity and spectrum efficiency for mobile communication services. In a DS-CDMA system, frequency offset between local oscillator and the carrier of impinging signal, timing offset between local generated PN sequence and received PN sequence, imperfect power control may exist and this degrades the performance of the smart-antenna algorithms. In this paper, the effects of imperfect power control, frequency and timing offsets on smart antenna algorithms will be presented. A smart antenna system has been set up to implement blind adaptive algorithms for DS-CDMA in a laboratory environment. The blind adaptive algorithms implemented on the smart antenna system are Least- Squares Despread-Respread Multi Target Array (LS-DRMTA) and Least- Squares Despread-Respread Multi Target Constant Modulus Algorithm (LS-DRMTCMA). Since both LS-DRMTA and LS-DRMTCMA algorithms utilize user's PN sequence, they have several advantages compared to other blind adaptive algorithms for DS-CDMA. BER and beamforming performances of LS-DRMTA and LS-DRMTCMA algorithms in a two-user and three- element-antenna array system will be evaluated for systems with timing offset, frequency offset and imperfect power control. The smart antenna system consists of two-signal generators and transmit antennas, three receiver-chains with half wavelength spaced three-element antenna array and a computer to process captured data in Matlab. Signal generators generate BPSK modulated signal for two users at 1,92 Mchips, at carrier frequency of 2.125 GHz. The receiving module includes three microstrip inset patch antennas, three -receiver chains that makes the conversion from RF to baseband and sends the samples to computer for post processing in Matlab.

**(1) ID of Commission:** C (Signals and Systems)
**Session Topic:** C1.Beamforming and matched field processing.

## (2) Relation of this work to previous work

LS-DRMTA and LS-DRMTCMA are first introduced by Rappaport and Rong. Using computer simulations they have shown that for DS-CDMA, LS-DRMTA and LS-DRMTCMA performs best in frequency and timing offset conditions by comparing BER vs. Number of Users curves for different algorithms.

## (3) New knowledge contributed by this paper

In this paper, in addition to frequency and timing offsets the effects of imperfect power control condition on LS-DRMTA and LS-DRMTCMA will be examined using smart-antenna test bed in a laboratory setting.