

## ABSTRACT

Future generation communication systems require high data rate and high mobility communication which has good performance, good resistance to errors and good spectral efficiency. The recent multicarrier scheme although it can give high data rate communication system but the performance is poor while being used in high mobility scenario. The current multicarrier scheme require channel estimation to decode the received signal, but there are some conditions when the channel state information practically can be acquired, for example where the channel condition change very fast when user in high mobility condition.

To solve this problem, non-coherent transmission system without channel estimation is the answer. In this thesis the non-coherent transmission scheme that used is Differential Unitary Space Time Frequency Modulation (DUSTFM) for 2x2 MIMO and 4x4 MIMO are proposed. The proposed schemes are combined with MC-CDMA to give better performance in high mobility condition. The combined methods exploit the advantage of each scheme (MIMO, MC-CDMA, differential modulation, STFC), in order to achieve a high data rate communication system which is robust against frequency selective fading, multipath fading, and fast fading.

The proposed DUSTFM scheme for 2x2 MIMO can give better performance compared to the main reference that have been proposed by Tran when BPSK is used as mapper but the performance of the proposed system while QPSK is used as mapper, is significantly decline due to the inability of the symbol detection to separate the symbols effectively. The proposed DUSTFM for 4x4 MIMO can give better performance until 8dB of gain compared to the 2x2 MIMO with DUSTFM when both of them BPSK is used as mapper. However the 4x4 MIMO with DUSTFM model only can work well when every antenna is using different frequency band, this means the spectral efficiency of the 4x4 MIMO with DUSTFM model is very bad compared to the 2x2 MIMO with DUSTFM model.