# ABSTRACT

Precoding is a generalization of beamforming to support multi-layer transmission in multi-antenna wireless communications. Beamforming is a signal processing technique used in sensor arrays for directional signal transmission or reception. In conventional single-layer beamforming, the same signal is emitted from each of the transmit antennas with appropriate weighting such that the signal power is maximized at the receiver output. When the receiver has multiple antennas, single-layer beamforming cannot simultaneously maximize the signal level at all of the receive antennas. Thus, in order to maximize the throughput in multiple receive antenna systems, multi-layer beamforming is required.

This Final Project is building a LTE linear precoding system for the transmitter side. The precoding system will be built in VHDL code and will be implemented on FPGA. In this Final Project, the precoding sistem consists of 64-QAM Mapper as input system, and will be connected to OFDM (IFFT) block. The precoding is built based on Transmission Mode (TM) 6 of LTE release 9 and will be using 3GPP codebook standard as the precoding matrix for TM 6 for 2x2 MIMO.

The Final Project shows that by the used of linear precoding system in transmission, it decreases the complexion of detection system in precoding block on the receiver side. The implementation process shows that the Final project is implementable on hardware and will use 62% ocupied slies, 11% slice register, and 27% of bounded IOBs resources of FPGA. with 2021 clock in total process, 121 clock in delay process and 1900 clocks to produce one OFDM symbol. The bitrate of the system is 161,68 Mbps.

Keywords: Linear precoding, codebook, FPGA, VHDL, MIMO