ABSTRACT

Polar codes that has been developed by Arikan in 2009 is the first coding scheme proven mathematically to achieve Shannon channel capacity. The transformation involves two key operations called channel combining and channel splitting. The channel combining uses exclusive-or (XOR) operations to polaryze the quality of the channels into either completely noisy or noiseless channels.

This thesis presents extrinsic information transfer (EXIT) analysis for iterative-decoding of Polar codes to reveal the mechanism of channel transformation. The purpose of understanding the transformation process are to comprehend the placement process of information bit and frozen bit and to comprehend the security standard of Polar codes. Mutual information derived based on the concept of EXIT chart for check nodes and variable nodes of low density parity check (LDPC) codes and applied to Polar codes.

This thesis explores the quality of the polarized channels in finite block-length. The finite block-length is of our interest since in the fifth telecommunications generation (5G) the block length is limited. This thesis reveals the EXIT curve changes of Polar codes and explores the polarization characteristics, thus, high value of mutual informations for frozen bit are needed to be detectable. If it is the other way, the error correction capability of Polar codes would be drastically decreases. These results are expected to be a reference for developments of Polar codes for 5G technologies and beyond.

Key words **:** *Polar codes*, *EXIT chart*, *coding theory*, *information theory*.