ABSTRACT

Channel coding is necessary in wireless communication systems, because the data is easily corrupted by noise during the transmission. The fifth telecommunication generation technology (5G) uses Polar codes and quasi-cyclic low density parity chech (QC-LDPC) codes as the channel coding schemes. Since a good channel coding is sensitive to the channel effect, among those two types of channel coding Polar codes can achieve Shannon limit. However, Polar codes are affected by extreme channel variation, the performances of which are not optimal. This thesis studies and investigates the effect of varying channel to the Polar codes design.

Polar codes use Bhattacharyya to determine the position of frozen and information bits. This thesis examines the Bhattacharyya parameter with several size of block lengths, i.e. 8, 16, 32, 64 and 128 bits at signal-to-noise ratio (SNR) between –15 until 50 dB. This thesis designs standard Polar codes with soft decoding Polar codes with binary phase shift keying (BPSK) modulation. This system is examined over 2 condition of channels, there are additive white Gaussian noise (AWGN) and Rayleigh fading channels in terms of bit error rate (BER).

The result of this thesis are (i) allocation of frozen bits and information birs for each SNR, (ii) evaluation of Polar codes performance with Bhattacharyya parameter and Polar Weight on AWGN and Rayleigh fading channels, (iii) classification table of frozen bits and information bits allocations Polar codes with Bhattacharyya parameter with blocklength of 8, 16, 32, 64, and 128 bits on SNR –15 to 50 dB. These results are expected to be an accurate reference for implemantation of Polar codes with Bhattacharyya parameters.

Keywords: Polar codes, Bhattacharyya Parameter, Polar Weight, AWGN, Rayleigh Fading