

## ABSTRACT

Future Railway Mobile Communication System (FRMCS) signaling is an emerging technology for railway signaling that is going to replace Global System for Mobile Communication - Rail (GSM-R) as railway signaling standard starting from 2022. This thesis analyses 5G channel coding, Quasi-Cyclic Low Density Parity Check (QC-LDPC) codes, which is proposed for FRMCS, specified by Union Internationale des Chemins de fer (UIC) in Europe.

This thesis considers QC-LDPC codes, because QC-LDPC codes are used by 5G New Radio (NR) and have the ability to adapt through the dynamic channel due to the rateless characteristic of Raptor codes. Evaluation is performed by using Extrinsic Information Transfer (EXIT) chart in Binary Erasure Channel (BEC) with erasure probability ( $\epsilon$ ) obtained by converting Bit Error Rate (BER) under Indonesia FRMCS channel.

This thesis has successfully: (a) analyzed QC-LDPC codes FRMCS with EXIT chart and found that Raptor codes characteristics on QC-LDPC codes is useful especially at signal-to-noise power ratio (SNR) below 15 dB and (b) found equivalent erasure probability ( $\bar{\epsilon}$ ) of BER performances under Indonesia FRMCS at speed up to 500 km/h, which is useful for evaluation under BEC channels. Results of this thesis are expected to provide a large contribution on software as well as hardware developments for Indonesia FRMCS high speed train.

**Keywords:** FRMCS, QC-LDPC codes, railway signaling, EXIT chart.