

ABSTRACT

High speed railway signaling technology is developing rapidly so that conventional technology such as global system for mobile communication–railway (GSM-R) will be supported by industry until the end of 2030. This undergraduate thesis conducts a performance study of future railway mobile communication systems (FRMCS) based on the fifth generation new radio (5G NR) for Doppler effect to replace GSM-R for high speed railway in Indonesia. This undergraduate thesis proposes the Indonesian FRMCS channel model and uses it to evaluate the performance of FRMCS on the Doppler effect that occurs because the train runs at high speed.

Channel validation and performance evaluation are performed using simple channel coding and various test scenarios, namely modulation, block length, and speed. All evaluations are carried out with a computer simulation taking into account realistic Indonesian parameters. This undergraduate thesis produces outage performances of FRMCS Indonesia channel which is validated with frame error rate (FER) and bit error rate (BER), all of which confirm with the same performance curve gradient.

This undergraduate thesis finds that the FRMCS Indonesia channel model has 5 path which has diversity better than single path on GSM-R. This undergraduate thesis has shown that FRMCS is promising as the future high speed railway technology because of its reliability to the Doppler effect that occurs at high speeds and is able to utilize multi path fading channels and diversity even with repetition codes which are simple channel coding. The results of this undergraduate thesis are expected to be the main reference in the development and implementation of FRMCS in Indonesia.

Keywords: Doppler Effect, Channel Model, FRMCS, Modulation, Blocklength, Speed.