ABSTRACT

The 5th telecommunication generation (5G) is under deployment worldwide since 2020 including Indonesia for future better services using 1–100 GHz band, which is sensitive to the environments. For optimal 5G deployment in Indonesia, this thesis proposes Indonesia 5G channel model based on computer simulation considering the influence of temperature measured from real-field experiments, where Telkom University, Bandung, Indonesia, is chosen as a representative location.

This thesis considers an operating frequency of 28 GHz and bandwidth of 200 MHz. This thesis derives power delay profile (PDP) representing the 5G Telkom University channel model. Based on the PDP, this thesis calculates the outage performances to predict the 5G performance in Indonesia to be the reference for any 5G technologies, since the outage performance is derived based on the theoretical Shannon channel capacity, which is independent of any technologies, for a probability of error asymptotically goes to zero.

The outage performance of 5G Telkom University channel models are validated using frame error rate (FER) performances of cyclic-prefixed orthogonal frequency division multiplexing (CP-OFDM) numerology $\mu = 3$ with 5G complex-binary phase shift keying (C-BPSK). Convolutional codes and quasi-cyclic low density parity check (QC-LDPC) codes are also used in this thesis as the channel coding schemes to validate the theoretical outage. This thesis also proposes a framework to derive the Telkom University 5G channel model considering temperature, which is also applicable to other Indonesia regions. The proposed framework can be used to derive 5G channel model and their outage performances of any locations in Indonesia.

This thesis found that maximum temperature causes less number of path in PDP, which is also resulting slightly worse performance compared to that of minimum temperature. This thesis also found that strong coding such as QC-LDPC codes should be used to validate the outage performance of the system. The results of the 5G channel model in this thesis are expected to provide contributions to the design of 5G in Indonesia with suitable parameter setting of the system considering the temperature effect of the transmissions.

Keywords: *5G Channel Model*, *Temperature Effect*, *Power Delay Profile*, *Outage Performance*.