ABSTRACT

The growth of human needs of telecommunication requires new development from existing technologies. Generalized Frequency Division Multiplexing (GFDM) *is one of the candidates for the 5th Generation* (5G) *technology multiplexing techniques in wireless communication. Wireless telecommunications transmission systems have a drawback, which is being susceptible to interference. Wireline telecommunications transmission systems also have drawbacks, which is a small coverage area. Radio over Fiber* (RoF) *is a technology to combine both telecommunications transmission systems to get a good signal quality and wide coverage area.*

In this thesis, a GFDM *design is performed on* 5G *for* RoF *networks using a bit rate of* 2.5 Gbps. *The digital modulation used here is* 64-*Quadrature Amplitude Modulation* (64-QAM) *and it uses* 3.5 GHz *radio frequency. In this thesis, an analysis of transport aspects is carried out for the optical modulation process. The variation in the distance of the optical fiber cable used are* 20 km, 40 km, 60 km, and 80 km.

Based on the results of the research, the use of optical modulation and optical fiber cable distance affects performance of the RoF *network. The use of optical modulation in external modulation has better network performance compared to direct modulation. The farther distance of the optical fiber cable used results in the worse network performance, based on the value of the Bit Error Rate* (BER) *obtained from the simulation results. The* BER *value at a distance of* 20 km *uses an external modulation scenario is* $8{,}81735 \times 10^{-26}$*, while using a direct modulation scenario is* $3{,}76758 \times 10^{-20}$. *At a distance of* 80 km, *the* BER *value using an external modulation scenario is* $1{,}67967 \times 10^{-19}$ *while direct modulation is* $1{,}25316 \times 10^{-13}$.

***Keywords*:** GFDM, RoF, *transport aspects*