

## ABSTRACT

*Radio-over-Fiber* (RoF), an optical access network technology that is transmitting a radio frequency signal and support a high speed broadband service. This kind of technology is developed from carrying analog radio signals (*Analog RoF*) to digital radio signal that can be obtained from digitizing the analog radio signal itselfes (*Digitized RoF*). Transmitting analog radio signals still had so many problems including signal power degradation that is caused by attenuation from optical fiber link, an inter-modulation distortion (IMD) that is caused by nonlinearity factor from optical component and microwave signal, and latency from optical fiber propagation.

In this research, writer analyzed the performance on *Digitized RoF* system integrated with WDM-PON network and measured by its BER, *Q-Factor*, and power level at transmission distance 40 km to 120 km. Its performance then compared with *Analog RoF* system. The research started with designing the *Analog RoF* system and *Digitized RoF* system that is integrated with WDM-PON network. The design will be implemented in the simulation software.

From the simulation, we get the result from *Analog RoF* system where the *Q-Factor* 16,26 and BER  $6,36 \times 10^{-55}$  at the distance of 40 km, 14,03 and BER  $1,47 \times 10^{-31}$  at the distance of 60 km, 8,92 and BER  $6,39 \times 10^{-17}$  at the distance of 80 km. The simulation of *Digitized RoF* system provides *Q-Factor* 22,15 and BER  $1,56 \times 10^{-100}$  at the distance of 40 km, *Q-Factor* 17,84 and BER  $1,14 \times 10^{-55}$  at the distance of 60 km, *Q-Factor* 10,52 and BER  $2,04 \times 10^{-25}$  at the distance of 80 km.

**Keywords:** *Radio-over-Fiber, Analog Radio-over-Fiber, Digitized Radio-over-Fiber, WDM-PON, BER, Q-Factor*