ABSTRACT

Based on the standards set by the ITU-T (G.989.1 to G.989.3), the latest generation of PON is the NG-PON2 that can transmit data with bitrate more than equal to 40/10 Gbit/s for DS/US. Currently NG-PON2 can be one of the technology solutions in the bandwidth-limited problem on Passive Optical Network technology. Due to TWDM techniques with the Optical Line Terminal aggregation or stacking method that promises future broadband networks with enormous bandwidth.

In this research, will discuss the design and evaluation of NG-PON2 bi-directional system and network with TWDM technique. Simulates the design of eight TWDM channel systems with 80 Gbit/s bitrate downstream (WDM) from every channel bitrate is 10 Gbit/s and 10 Gbit/s for upstream (TDM). Then to simulate the design of three splitting network with splitting ratio 1:256 and the longest distance of transmission is 40 km. Then adds a length EDFA of 1 to 5 meters as a pre-amplifer and booster amplifier with 100 mW to 1000 mW of pump laser power as well as 980 nm and 1480 nm wavelengths of the pump laser on a system that has been designed. From the results of the simulation, system analysis performed by the Receive Power, Q factor and BER as a measurement parameter. Also, the amplifier analysis is performed on the change of power and wavelength with Gain and OSNR as its measurement parameters.

Obtained by the simulation result, EDFA with length 2 meters, power 400 mW, and wavelength 1480 nm can provide the best performance improvement for downstream transmission with parameter value Q factor is 9.99 to 15.75; BER is $3.33x10^{-56}$ is $7.06x10^{-26}$; Power Received is -20.12 to -19.11 dBm; Gain is 14.18 to 15.60 dB; dan OSNR is 54.01 to 54.37 dB. And for simulation result on the upstream obtained with EDFA with length 2 meters, power 600 mW, and wavelength 1480 nm with parameter value Q factor is 10.09 to 15.40; BER is $7.68x10^{-54}$ to $2.75x10^{-24}$; Power Received is -14.11 to -11.62 dBm, Gain is 17.97 to 20.44 dB and OSNR is 54.01 to 54.37 dB.

Keyword **:** *TWDM, PON, NG-PON2, EDFA, WDM, TDM.*