

## **ABSTRACT**

*Passive Optical Network (PON) with bit rate of 2.5/1 Gbps sometimes not able to overcome the bandwidth requirement so that needed an update of access network in order to produce bigger bit rate. The latest generation of PON that is Next Generation Passive Optical Network stage 2 (NGPON-2) can transmit data communications with bit rate  $\geq 40$  Gbps for downstream and 10 Gbps for upstream direction. April 2012 ITU-T sub-organization FSAN recommends Time Wavelength Division Multiplexing Passive Optical Network (TWDM-PON) as the main solution for NGPON-2.*

*In this Final Project simulated the Time Wavelength Division Multiplexing Passive Optical Network (TWDM-PON) network model using OLT stacking method. Total bit rate aggregation used is 80 Gbps for downstream and upstream direction with link length 40km, 50km, and 60km, the splitt ratio used is 1 : 128, 1 : 256, and 1 : 512. The system model is analyzed using Performance of Power Received, Q-Factor, and Bit Error Rate (BER) parameters. Then the performance results are compared between the use of photodetector PIN and APD on the receiver.*

*The simulation result shows the photodetector APD gives a performance best on each performance parameter. On 128 ONU the downstream direction generates receiver-receive power of -22.484 dBm, with a Q-Factor value of 23.841 and a BER value of  $2,64 \times 10^{-127}$ , while in upstream direction the received power of receiver equal to -21,481 dBm, with value of Q-Factor equal to 34,084 and value of BER equal to  $8,49 \times 10^{-266}$ . In the 256 ONU scenario the downstream direction of the received power is -25.73 dBm, with a Q-Factor value of 22.49 and the BER value of  $2,43 \times 10^{-112}$ , while in the upstream direction the received power is -24.3 dBm, with a value of Q-Factor of 28.94 and a value (BER) of  $1,23 \times 10^{-184}$ . In the 512 ONU scenario the downstream direction of the received power is -28.66 dBm, with the value of Q-Factor of 22.69 and the BER value of  $1,01 \times 10^{-123}$ , while in the upstream direction the received power is -27.31 dBm, with a Q-Factor value of 39.88 and a BER value of  $1,41 \times 10^{-196}$ .*

**Keywords: TWDM-PON, Photodetector, PIN, APD, BER, Q-Factor.**