

## ABSTRACT

*One of the recently-developed optical fiber communication technology is Next-Generation Passive Optical Network Stage 2 (NG-PON2). NG-PON2 is initiated to fulfill the needs of next generation broadband access network with the ability to increase the bitrate up to more than 10 Gbps with OLT aggregation methods and using Time-and-Wavelength Division Multiplexing (TWDM) technology. But NG-PON2 access network hasn't been implemented in Indonesia yet.*

*Design and performance analysis of TWDM-based NG-PON2 network is done in this final project. The design is done to find out the effect of the physical layer particularly the distribution segment to the performance of NG-PON2. For the testing scenarios, using 4 OLTs with bitrate of 40 Gbps (WDM scheme for downstream and TDM scheme for upstream), five types of optical fibers based on ITU-T G.652.C/D, G.652.B, G.653, G.655, and G.652.A, with distance of 20 km using two distribution points (with total split ratio 1:64 and 1:128), and without using amplifier. From the simulation results, analysis of Link Power Budget (LPB), Signal to Noise Ratio (SNR), Q-factor, and Bit Error Rate (BER) are done.*

*Based on simulation results, G.652.C and G.652.D fiber give the best performance in every performance parameters. Using 64 ONUs for downstream obtain LPB = -25.407 dBm, Q-factor = 9.115, BER =  $2.72 \times 10^{-19}$ , while for upstream obtain LPB = -25.037, Q-factor = 10.619, BER =  $1.36 \times 10^{-24}$ . And using 128 ONUs for downstream obtain LPB = -25.491 dBm, Q-factor = 8.576, BER =  $6.86 \times 10^{-16}$ , while for upstream obtain LPB = -25.047 dBm, Q-factor = 12.0638, BER =  $1.59 \times 10^{-24}$ .*

**Keywords :** NG-PON2, ODN, TWDM.