ABSTRACT

Optical communications systems are growing rapidly today, so broadband bandwidth requirements are increasing. WDM-based systems are used to efficiently utilize bandwidth. The use of Hybrid Optical Amplifier (HOA) is proposed to optimize the implementation of WDM-based systems in meeting the need for wide bandwidth gain and gain flatness, so as to handle large loads of networks at great distances.

HOA FRA-EDFA is a hybrid amplifier combination capable of providing wide bandwidth gain by utilizing excess features of each amplifier and cover loss. This final project discusses the characteristics of optical amplifier and performs performance test using a WDM-based manual transmission by using a hybrid optical amplifier (FRA-EDFA) with in-line parallel configuration. Long haul U-DWDM system is used as a performance amplifier test medium. U-DWDM long-distance system is simulated up to a distance of 250 km using 80 canals and a very tight room that is 0.19 nm.

Hybrid amplifier optimization (FRA-EDFA) using Gain Flattening Filter (GFFr) makes a gain of approximately the same intensity with an average of about 28.94 dB. The flat gain value is in the 96 nm bandwidth range at the wavelength of 1529.5 - 1625.5 nm. From the simulation results of the amplifier on the system, there is the most optimal configuration of HOA FRA-EDFA in-line parallel using one amplifier (FRA or EDFA only). From the results of simulation HAA FRA-EDFA parallel in-line on long haul U-DWDM system, obtained the low Q factor which is still ideal according to 6.10417 and BER 5.08E-10 at a distance of 210 km. Based on the Q factor and existing factors, this configuration is able to provide ideal performance with a maximum distance of 210 km.

Keywords: EDFA, *Fiber Raman Amplifier*, *Gain Flattening Filter*, *Gain-flatness, Hybrid Optical Amplifier*, U-DWDM, *Q Factor*.