

ABSTRACT

The rapid development of optical communication systems has resulted in increasing developments in WDM-based technology. Dense Wavelength Division Multiplexing (DWDM) which is the development of WDM has many advantages over its previous technology. However DWDM systems have some disadvantages, one of the disadvantages is the non-linearity effect that can affect the performance of optical networks.

Non-linear effects can cause several effects such as Self phase Modulation (SPM), Cross Phase Modulation (XPM) and Four Wave Mixing (FWM). There are 4 scenarios. The first scenario, doing mathematical calculations and simulations on the Long Haul U-DWDM system without Optical Amplifier and without non-linear effects. The second scenario, doing mathematical calculation and simulation on the Long Haul U-DWDM system with FRA-EDFA Hybrid Optical Amplifier amplifier and without non-linear effects. The third scenario, simulates a Long Haul U-DWDM system without Optical Amplifier and with non-linear effects. The fourth scenario, simulates a Long Haul U-DWDM system with a FRA-EDFA Hybrid Optical Amplifier amplifier and with non-linear effects.

The final results of the non linear Fourwave Mixing (FWM) effect on the Long Haul U-DWDM system can reduce the quality of performance on the system up to 10% in average. but with the addition of FRA-EDFA Hybrid Optical Amplifier (HOA) on the system it can minimize the non-linearity effect. So that the quality of the system performance will remain good even if it is affected by non-linearity effects.

Keywords: *U-DWDM, FWM, Hybrid Optical Amplifier.*