Analysis of WDM PON network for spectral width with EDFA

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***Abstract* -This paper analyses the performance of WDM PON network with EDFA. The utilize the cyclic property of Array wave guide grating. The analysis of the system is performed with varying the spectral width of the channel with EDFA. The pumping power is considered during the simulation at 980nm and 1480nm. Data rate is kept at 5Gbits to the 2.5Gbits/s.**

***Index Terms* - Optical communication, Wave division multiplexing (WDM), Passive Optical Network (PON),EDFA .**

I. INTRODUCTION

In optical communication information is transmitted inform the light which travel in the optical waveguide known as the optical fiber information travel with the light speed so the speed of the data transmission is very in respect to the electrical communication[1-3]. Now a days optical communication system is available for optical fiber and wireless communication.

Optical communication supports the higher data transmission from 1Gbits/s to the 100Gbit/s data for short distance communication. If long length transmission is required than, high data rate performances become less effective. This is due to the different type of dispersion properties of the fiber and loss of signal strength with length of fiber.so there is need of system that strengthen the signal for a few km of length of fiber in a repetitious manner [4-5]. As the electrical amplifier, there is also the optical amplifier is available for enhancing signal strength with utilizing the properties of stimulated emission. EDFA, Raman is the type of amplifier [6-8].

II. PROPOSED DESIGN

This paper proposed the design of WDM PON using the AWG and EDFA. Different pumping power is applied and with a variation of spectral width . Pumping power for 980nm is carried out for analysis of system performance. Forward pumping is utilized in the downstream direction and backward pumping is utilized for upstream direction. Design is shown in fig .1 where the array wave guide gratings is implementated in WDM PON in place of WDM MUX for introducing the cyclic effect in system performance. The Data rate is fixed at the 5Gbits/s at the transmitter and Optical network unit (ONU) side. As shown in figure we use an array of laser source at the optical line terminal (OLT).

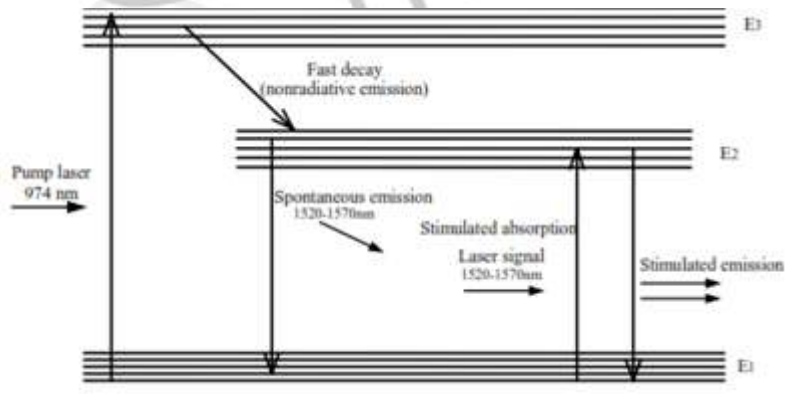

Figure.1. Stimulated principal of EDFA

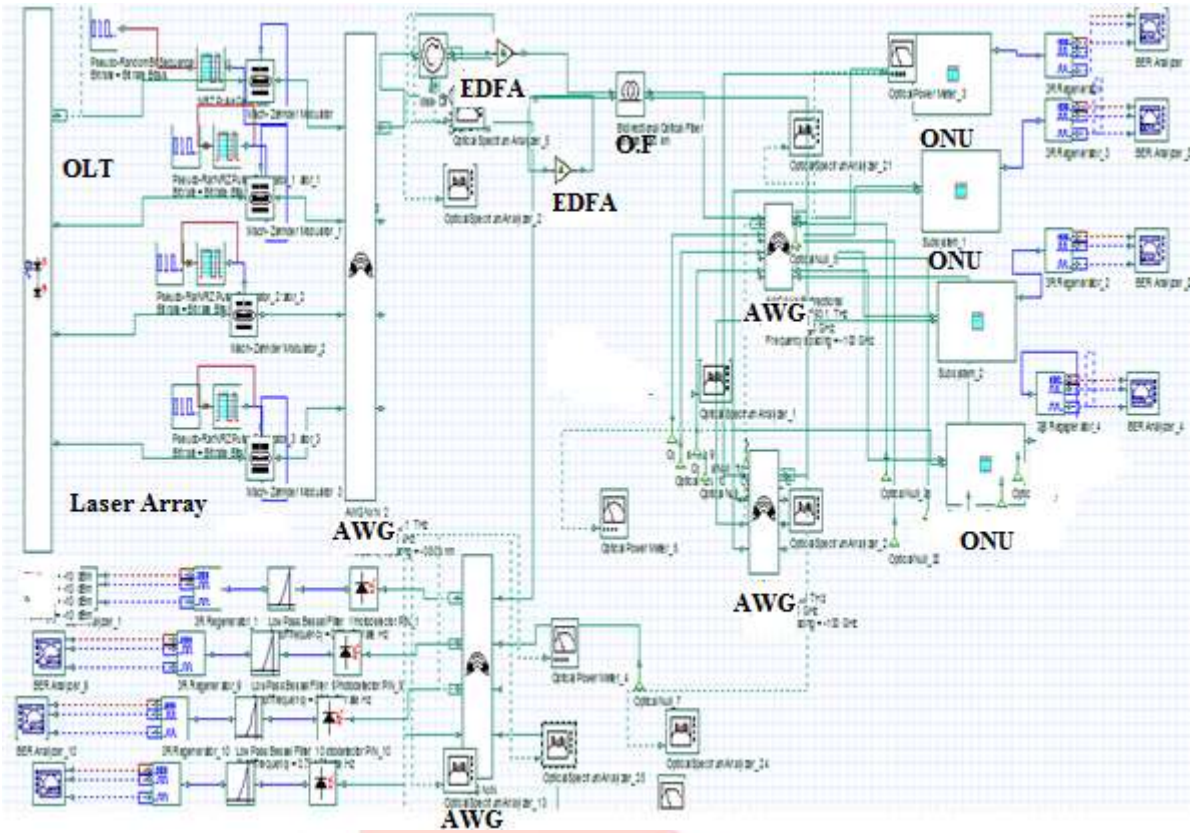

Figure.2 WDM PON Network using AWG

III. RESULT AND ANALYSIS

Figure 3 shows the variation of BER with a length of fibre in downstream and upstream direction for 10mw forward pump power in the downstream direction and 0.1mw power in upstream direction with backward power.

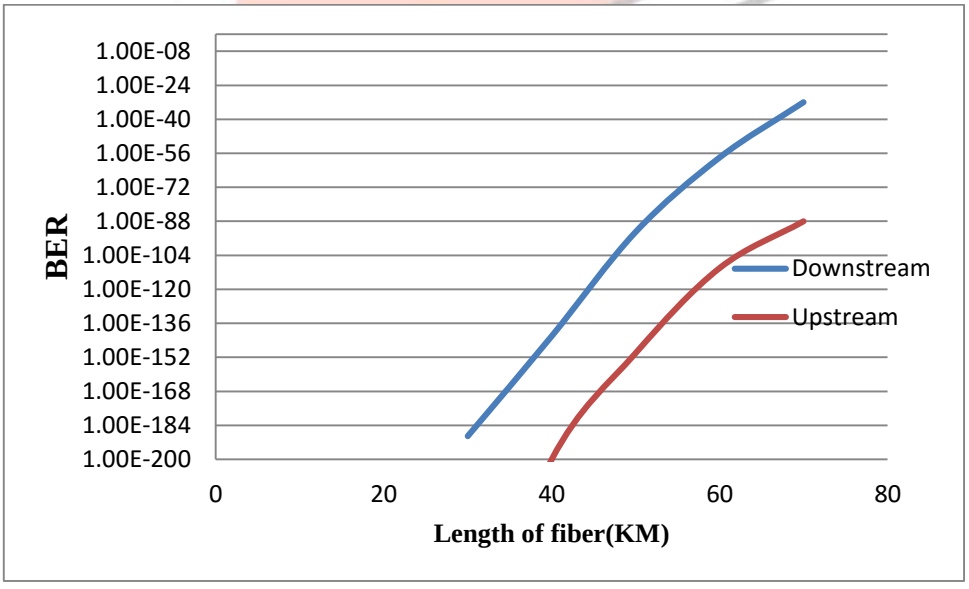

Fig.3Variation in BER with length of fiber

Figure.4 Shows the response of pump power with variation in spectral spacing in WDM system. It is seen that there is a small variation in BER with the pump power for spacing of spectral width.

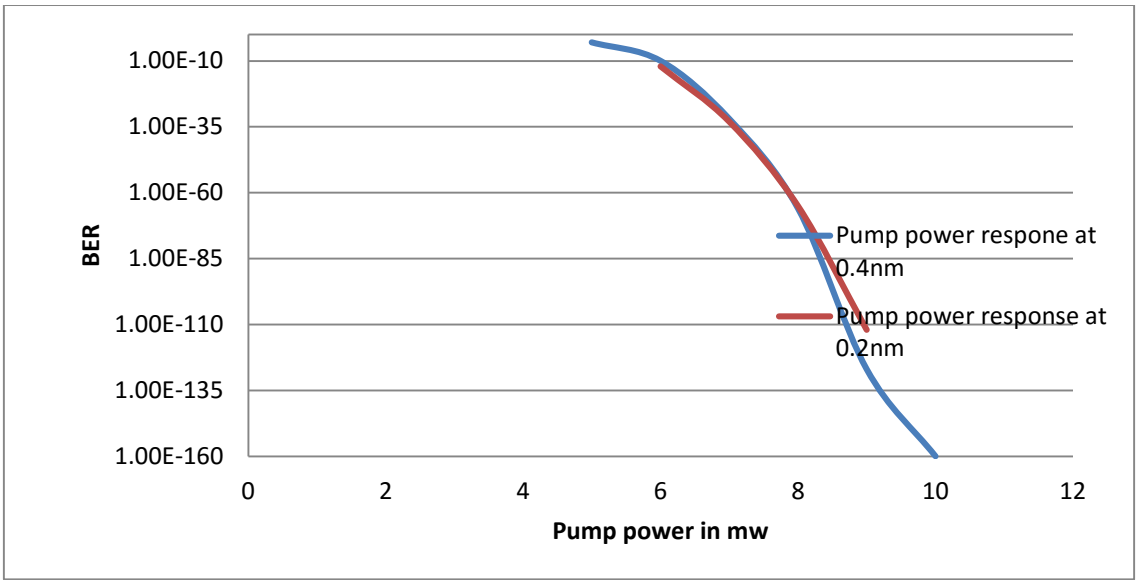

Figure4 Variation in BER with input pump power at different channel spacing

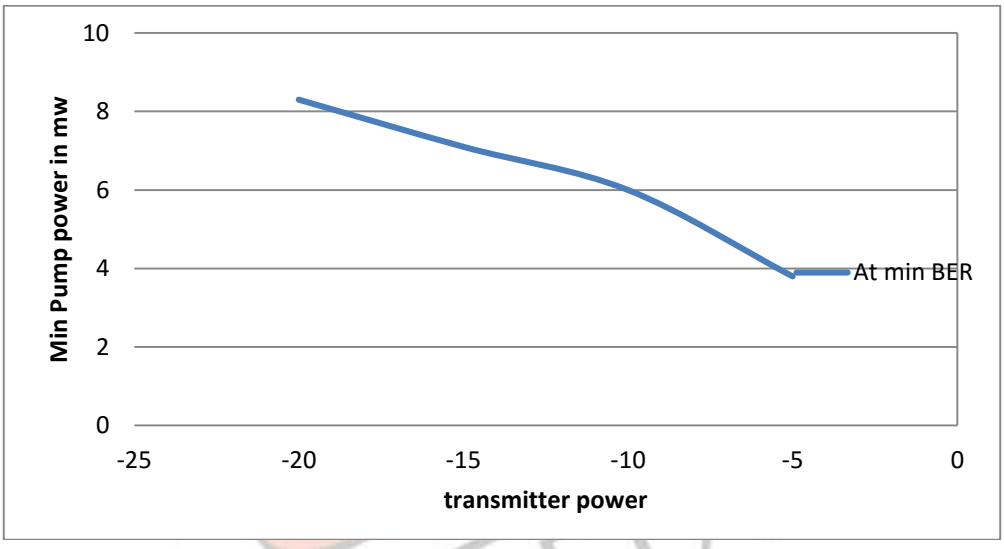

Figure.5 Variation in min pump power with transmitter power

Figure 5 shows the required minimum pump power with the input transmitter source power. It is seen that the variation is not in exact linear. At -20dbm transmitter power the required pump power is 8.3mW.

Figure 6 gives the relation between the gain of system at receiver side with the input pump power at the 40km length of fiber and 980nm pumping signal . The variation is analysis at the 0.2nm spectral width.

The spacing between the laser pulses is kept at 0.2nm in all cases. The simulation is done in a practical environment in all, with all nonlinear effect is kept on. Simulation is performed for the fiber with ITU standard single mode fiber (SMF). Dispersion of SMF is 17ps/nm km Decoder side after decoding the signal, the signal covert to electrical by passing to the photo detector and 0.75 GHz low pass Bessel filter (LPF) The dark current value was 5 nA, and the thermal noise coefficient was 1.8 x10–23 W/Hz for each of the photo-detectors.

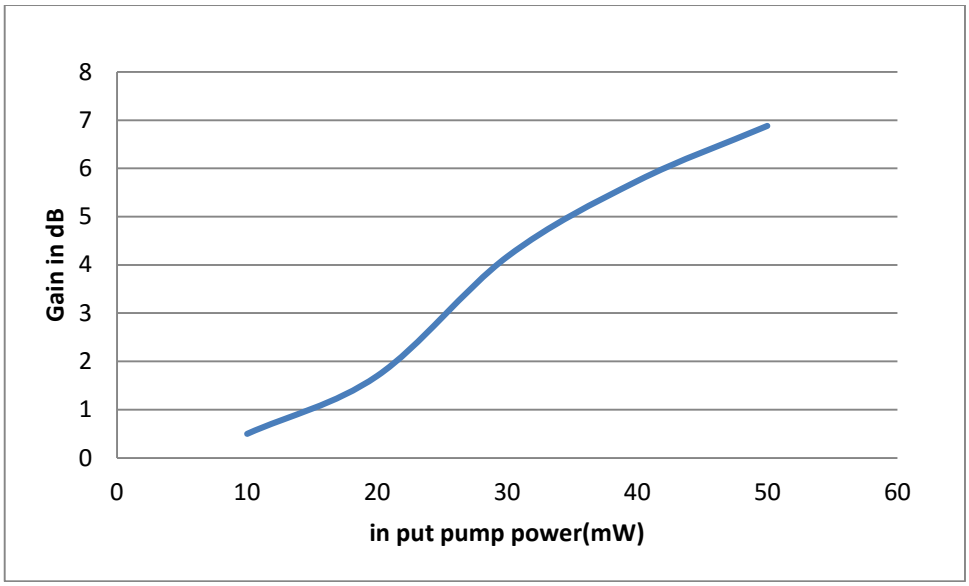

Figure.6 Variation in Gain with input pump power

IV. Conclusion

This paper analyzes the WDM PON network for varying the pumping power of EDFA and show that how system provide the response in BER, gain of the system . Application of Array waveguide grating (AWG) is shown in the design in place of WDM MUX. Forward pumping and backward pumping power is applied at the downstream and upstream direction. All analysis is carried at the 5Gbits/s. Spectral spacing of 0.4nm and 0.2nm. Simulation also shows the Variation in BER with a length of fiber for down and upstream data rates.

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