

**SPEED ENHANCEMENT OF NETWORK USING EDFA OPTICAL
AMPLIFIER USING OPTICAL PARAMETER**Shrija Jain¹, Sandeep Kumar²¹ M.Tech Scholar, Deptt. of ECE, PCET, LALRU(MOHALI), Email Id:-shrijajain1986@gmail.com² Asstt. Professor, Deptt. of ECE, PCET, LALRU(MOHALI), Email Id:- sandeepundri@gmail.com

Abstract- In this extension up to the fifth stage gives the better results. In this paper an Empirical & pragmatic implementation is applied using EDFA. The work is presented using different graphs & tabular comparison. The scope of this paper is to analyze the performance of augmented gain EDF amplifier systems by enhancing the stages of EDF amplifier & further by variation in pumping power on designed EDF amplifier system. The design evaluates the performance of the network for a given pattern specifies the design accessibility for the speed enhancement. The Performance of an Optical Communication system can be improved by the use of EDFAs as an Optical Amplifier. Erbium doped fiber amplifier (EDFA) is an important element in DWDM networks. For the present work, we have used EDFA design software tool. The proposed model consists of an input source, isolator, pump source, erbium fiber and WDM coupler. It simulates various characteristics such as amplified spontaneous emission, minimum gain, maximum gain, average gain, noise figure, gain flatness, gain tilt etc. in efficient manner. It confirms the excellent agreement between simulations and results obtained in real EDFA design. And also changing the design parameters on four stages EDF amplifier such as Input Pump Power, the different performance parameters (gain and noise figure) can be optimized without changing the values of isolator, erbium fiber length and WDM.

I. INTRODUCTION

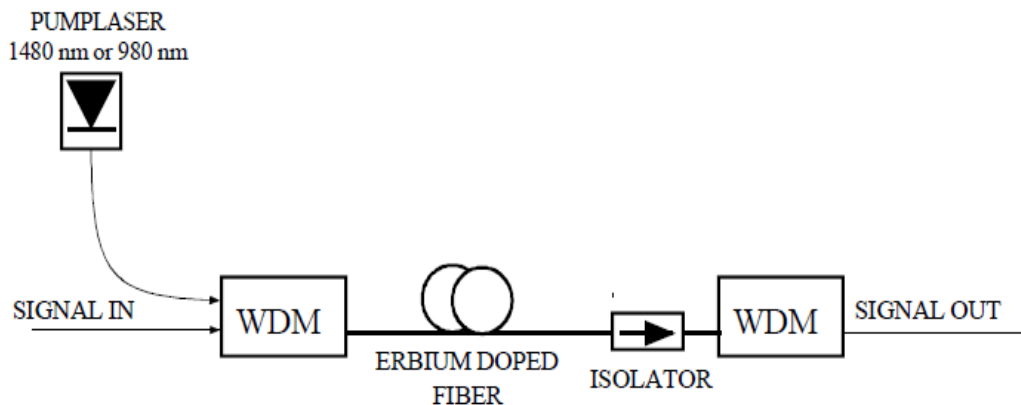
Optical fibres have become an unavoidable part of any high speed communication system due to its high information carrying capacity, high bandwidth and extremely low loss. The transmission performance of the optical communication systems is limited by the various effects such as attenuation, dispersion, non-linearity, scattering etc. To compensate for all these limitations the signals have to be regenerated within the transmission link. This can be done either by using optoelectronic repeaters or optical amplifiers. In optoelectronic repeaters the optical signal is first converted into an electric signal, then amplified in electric domain and finally converted back to optical signals. Such regenerators become quite complex and expensive for wavelength division multiplexed (WDM) light wave systems. Whereas optical amplifiers can amplify the optical signals directly without requiring its conversion to the electric domain. Such devices are called optical amplifiers. The practical use of optical amplifiers was an important milestone in the history of optical fibre communication system. The development of optical amplifiers started early in 1980's and their use for long haul communications systems became widespread during late 1990's. Optical amplifiers, however, provided flexibility while upgrading the installed transmission links to higher bit rates. This flexibility of the bit rate allows overcoming the electrical bottleneck of electronic repeater, which were unable to transmit at high bit rates. These optoelectronic repeaters provided with maximum of 40-80Gbit/s.

II. DOPED FIBER AMPLIFIERS

Doped fiber amplifiers (DFAs) are optical amplifiers that use a doped optical fiber as a gain medium to amplify an optical signal. They are related to fiber lasers. The signal to be amplified and a pump laser are multiplexed into the doped fiber, and the signal is amplified through interaction with the doping ions. The most common example is the Erbium Doped Fiber Amplifier (EDFA), where the core of a silica fiber is doped with trivalent Erbium ions and can be efficiently pumped with a laser at a wavelength of 980 nm or 1,480 nm, and exhibits gain in the 1,550 nm regions. An erbium-doped waveguide amplifier (EDWA) is an optical amplifier that uses a waveguide to boost an optical signal. Amplification is achieved by stimulated emission of photons from dopant ions in the doped fiber. The pump laser excites ions into a higher energy from where they can decay via stimulated emission of a photon at the signal wavelength back to a lower energy level. The excited ions can also decay spontaneously (spontaneous emission) or even through nonradioactive processes involving interactions with phonons of the glass matrix. These last two decay mechanisms compete with stimulated emission reducing the efficiency of light.

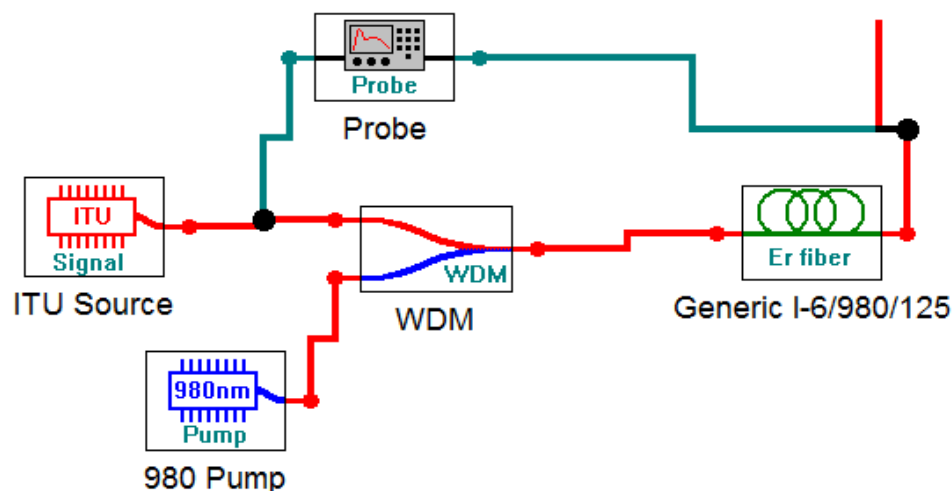
III. EDF- OPTICAL AMPLIFIER DESIGN

EDFA optical amplifier designing is done with help of the Fiber Optical Simulation Program & The Gain Master. Design tools are used. In this design we show that the optical amplifier gives all the parameter of the erbium fiber & that gives the idea how the signal is to be transfer from one location to the other location. In this design we find the gain, wavelength & noise parameter. The software allows for schematic representations of an optical amplifier to be input via a graphical user interface which mimics the symbolic language often used by engineers to outline a design on paper. The program tracks the optical power through the design, integrating the differential equations to solve the propagation of signal, pump, and amplified spontaneous emission (ASE) bands through all erbium fiber sections. Once a simulation is complete, the user may look inside the design by graphing the power propagating through any fiber in the design, as well as through the length of all erbium fiber sections. . Also, by use of the probe component, the user may make common two-point measurements of interest, such as gain, noise figure, conversion efficiencies, etc. Optical parameters of any component may be changed and the simulation re-run to observe the effects on amplifier performance. In this paper we have shown the variation of gain & noise with respect to the wavelength for the second stage of optical amplifier. The range consider the 1550 nm-1620nm. the software use is gain master of erbium doped fiber amplifier.

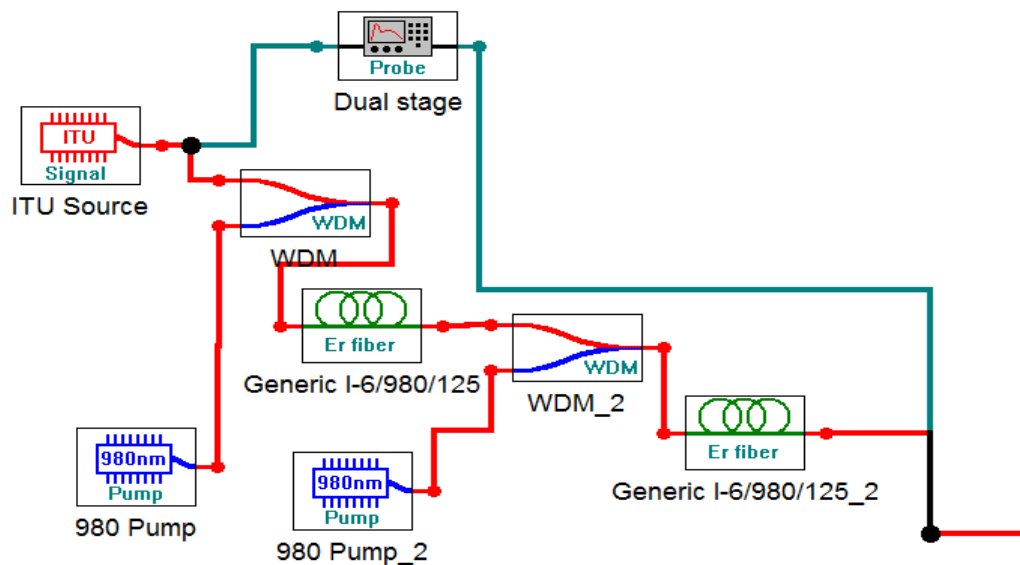


Software Used

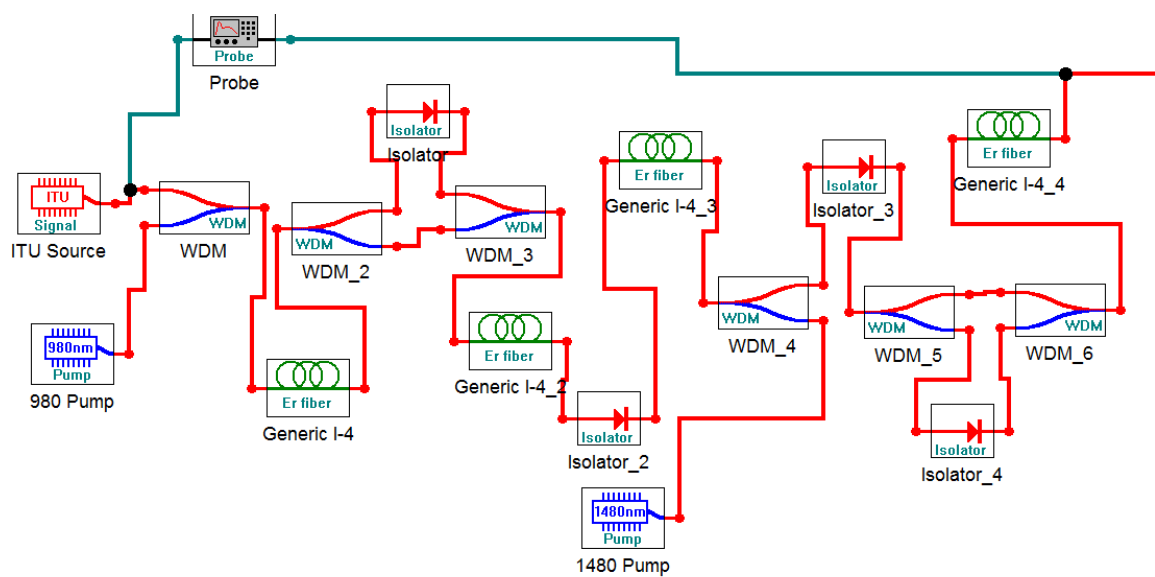
- (I) Fiber Optical Simulation Program
- (II) The Gain Master Design Tool



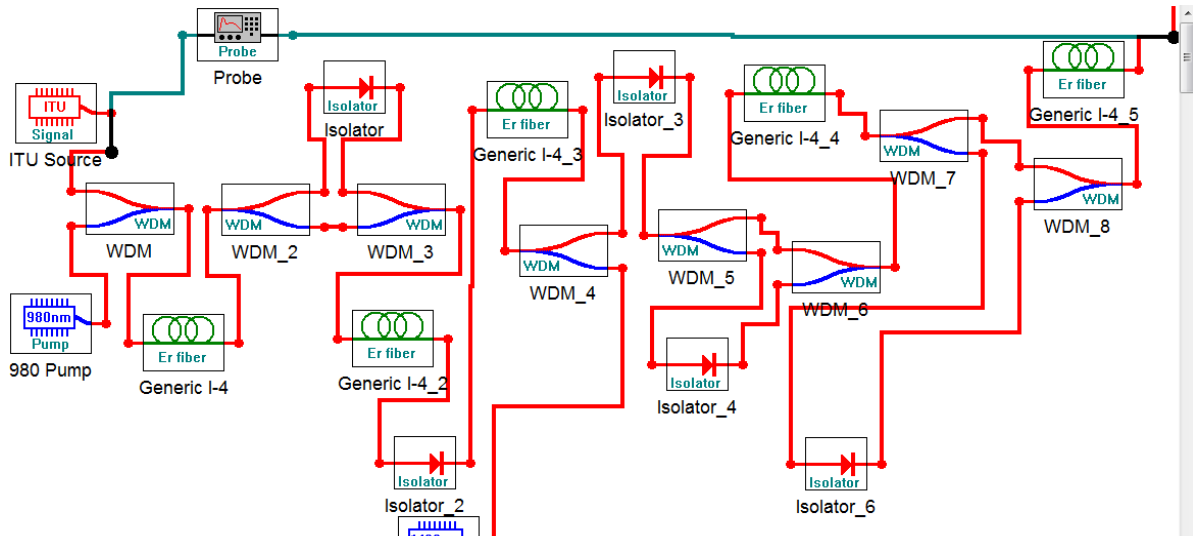
Single Stage EDF optical amplifier design



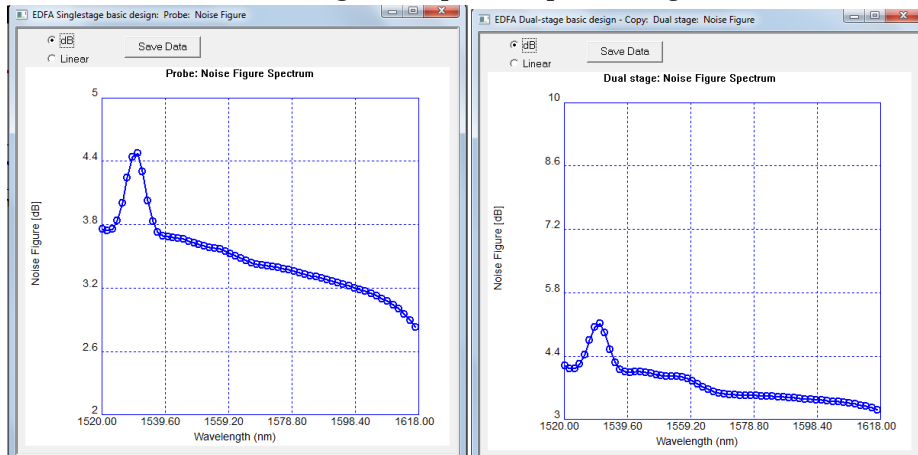
Dual Stage EDF optical amplifier design



Fourth Stage EDF optical amplifier design

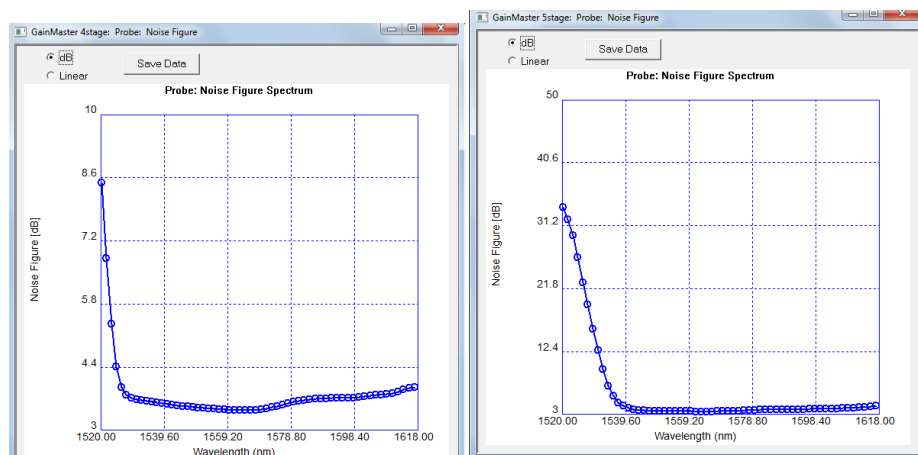


Fifth Stage EDF optical amplifier design



Fig(a)

Fig(b)



Fig(c)

Fig(d)

Noise figure spectrum of EDF optical amplifier (a) single stage (b) Dual stage (c) fourth stage (d) fifth stage

IV. OPTIMUM PARAMETERS

Table 3.1 Analysis of Gain, Noise figure for fifth & second stage

Sr. No	Parameter	Range in db(fifth stage)	Range in db(second stage)
1	AVERAGE GAIN	32.183	30.884
2	MAXIMUM GAIN	41.106	36.976
3	MINIMUM GAIN	-29.422	7.130
4	GAIN FLATNESS(P-P)	70.528	29.846
5	GAIN FLATNESS(RMS)	17.662	10.098
6	GAIN TILT	25.908	-28.584

V. CONCLUSION

This Paper shows that the optical amplifier is to be used for amplify the signal and basically design an optical amplifier to increase the level of the input signal & found optimum parameters for transmission of data. In this paper wavelength division multiplexing technique is used for the multiplexing with input signal, the range of the optical amplifier is basically 1550 -1620 nm. It can be use only up to the 10-30m. This paper shows the results of the fifth stage of the optical amplifier.

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