Comparative analysis of Lasers in Optical Communication System using FSO

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Abstract— This paper Analyze the comparative study of various lasers in free space optics by varying the distance. The fsa data and distance limit are 2.5 Gbits and 1Km. The distance of fso increase using amplifier upto few km respectively. In this paper we are improve the these short coming by using wdm concept and transfer data 64x2.5 Gbits on fso and compare results using DML and EML laser, it is also observed by using EDFA amplifier we can increase the Distance up to 25 Km with same data Rate. The work on suitability of various lasers like, directly modulated laser and Electro-absorption modulated Laser for an optical transmission link is evaluated. The results have been carried out by evaluating the value of Quality factor and BER at different values distance in km. It is found that using directly modulated laser; the signal can travel up to transmission length of 25 km with acceptable BER and Q factor. Keywords: Free Space Optics (FSO), Pseudo-Random Bit Sequence (PRBS), Electro-Absorption Laser (EML), Directly Modulated Laser (DML)

I. INTRODUCTION

In Optical communication system the free space optics provided unprecedented capacity in modern networks. Light wave technologies offer the promise of high bandwidth connectivity from component development that is manufacturable, cost effective and electrically efficient. High performance, reliable and low cost semiconductor lasers are crucial for applications in optical communications. Lasers are devices that produce narrow beams of light which are monochromatic, coherent, and highly collimated [8-5]. The wavelength of laser light is extremely monochromatic when compare to other sources of light, and all of the photons that make up the laser beam have a fixed phase define relationship with respect to each another [4]. As quickly as development of epitaxial processes allowed, the quantum well became the standard laser structure, and at this point, the fraction of the commercial diode laser market that does not employ a quantum well active layer may well be essentially zero [7,3]. The role of wdm in free space by bindhu sharma [1] investigated the effect fso using 2x10 Gbits the results are evaluated in terms of bit error rate. The Many researcher have employed different multiplexing scheme which is widely used in optical communication system[6]. To replicate that we employ non return to zero modulation format in 64 channel with data rate 2.5 Gbits each channel and wavelength 1550 nm with narrow spacing 0.1nm the signal is multiplexed Using wdm and channel used in free space of the range 25km we are use EDFA instead optical amplifier which enhanced the system performance on 25km distance and improve data bit error rates. The rest of paper is Define, section II consist of system setup, results and discussion is presented in section III and IV concludes the paper.

II. SYSTEM SETUP

The proposed fiber communication system deploying a high speed semiconductor lasers are shown in figure 1. A data sequence with a bit rate of 64x2.5 Gb/s is generated by a pseudo-random bit sequence (PRBS) generator. This information code is then converted into electrical signals with either NRZ formats by a pulse generator. In the laser driver model, the bias and modulation currents are combined (direct modulation), and the modulating current is the form of the stream input signal.

![Fig. 1: Simulative Set up](image)

The laser signal is transmitted down using wdm by wavelength 1550nm with 0.1nm spacing on free space optics channel. The reverse operation performed at receiver side, the receiver detects the laser signal and converts it into an electrical signal by a PIN photo detector. Electrical filter at the receiver side is implemented by Bessel filter. BER analyzer as the measurement component is used to obtain the eye diagram. From the eye diagram, the values of Q factor and BER can be analyzed.

III. RESULTS AND DISCUSSION

To analyze the performance of the system quality factor and bit error rate using different types of laser are calculated. The Q factor vs. length for different types of lasers is as shown in Fig.2. It is evident that the quality of the received signal decreases with increasing the length of the fiber. The acceptable Q factor of 16 is obtained up to 26 km transmission distance using directly modulated laser. It is observed that at by using EML laser, acceptable quality factor is achieved for 22 km and 25 km transmission distance respectively.

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Further the performance of the system has been calculated using Eye Diagram Shown in figure Opening of Eye Height Define the overall system performance.

IV. CONCLUSION

The performance of optical communication system is analyzed using different types of lasers by varying the value of distance. The system performance is evaluated in terms of the quality factor and bit error rate on the different FSO length. Electro-absorption modulated laser (EML) achieves the maximum transmission distance of 8 km at 64x2.5 Gbps bit rate and shows the best results among all the lasers followed by directly modulated laser with 24 km and 26 km. However the maximum reachable distance of 26 km at 64x2.5 Gbps is achieved with acceptable quality factor and bit error rate. It is also observed that the Maximum Eye Height Obtained using DML laser and height decrease when increases distance above 25 km.

REFERENCES


