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Simulation of Gigabit Ethernet in L-Band

KEYWORDS

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ABSTRACT *This paper deals with the performance analysis of Gigabit Ethernet Passive Optical Network (PON) with the transmitting wavelength as 1600nm(L band) using OPTSIM software. The focus area would be the power attenuation at the receiver side and also the system design.*

I. INTRODUCTION

Fibers to the home (FTTH) networks are getting very popular nowadays with the introduction of FTTH broadband systems by many companies like Airtel, BSNL etc. In this paper we are looking at the viability of FTTH networks using GEPON architecture with the reference wavelength of 1600 nm. Gigabit Ethernet networks are generally used for short distance high density networks like company offices, factories etc and wavelength range of 1300 nm to 1550 nm is used. 1600 nm wavelength has not been used for this purpose and this is the focus of this paper.

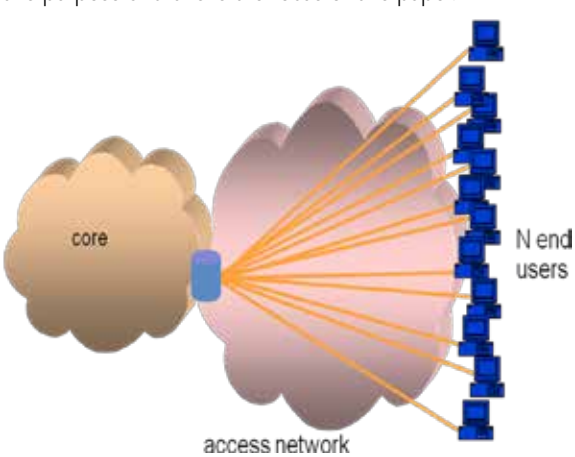

Fig1. FTTH Network

II. Gigabit Ethernet

Gigabit Ethernet networks are used to provide data rates of more than 1Gbit/s using Ethernet frames and are covered under the protocol IEEE802.3ah. Earlier it was thought that only optical fibers can provide such speeds but in recent times special copper cables are also used for this purpose. The main limitation for using copper cables is the distance of transmission possible which is less than a kilometer in some cases. Though initially deployed as high density backbone networks only now they are being used for all kinds of optical networks.

III. Transmitting wavelength

The transmitting wavelength plays an important role in defining the characteristics of the optical link. GEPON networks usually use the following bands

- Upstream – 1260-1360 nm
- Downstream - 1480-1500 nm
- Video overlay - 1540=1560nm

The maximum wavelength used for transmission is 1560 nm. In this paper the performance of GEPON network is analyzed with 1600 nm as the transmission wavelength.

IV. network

The network topology is very important for any communication network. This paper deals with connecting optical fiber cables both in series and parallel. The analysis of the network is used to determine the number of times optical fiber cables can be connected in series with detectable power on the receiver side. Also the role of Passive Optical splitters in the network is vindicated. The number of users can be increased by using passive optical splitters and passive electrical splitters. Matched filters are used on both the optical fiber side and electrical fiber side to remove error due to transmission and conversion from due to photodiode respectively.

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Fig.2 Series Network

Fig.3 Series and Parallel Network

V. Simulation results

The simulation result shows that the received power decreases as the number of users increases. Fig.5 shows the power spectrum density of the system when the output is taken across the splitter. From this graph, the maximum power is obtained at 1600nm. Fig. 6 shows the optical eye diagram measurement. This means that the system can easily transmit and receive 0 and 1 bits which increase the stability of the system.

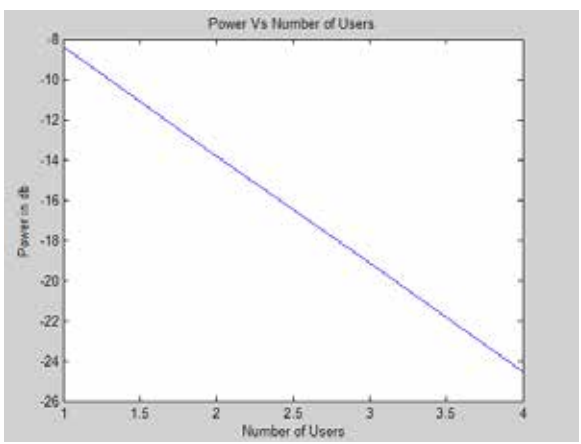

Fig4. Power Vs Number of Users

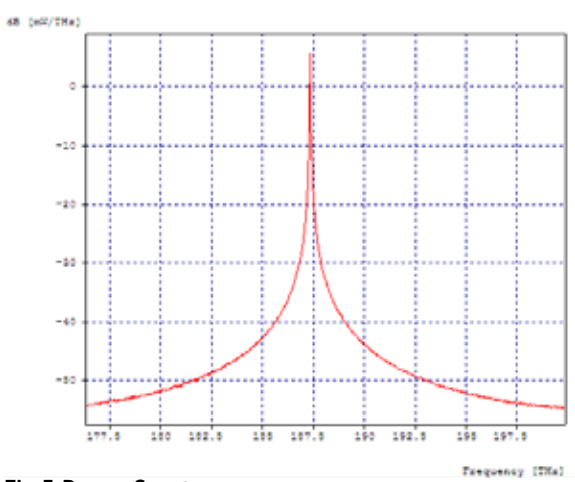

Fig.5 Power Spectrum

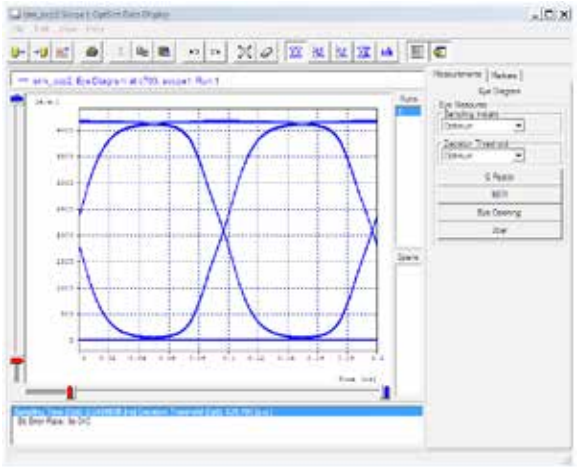

Fig.6 Eye Diagram

VI. Conclusion

This paper simulates optical gigabit Ethernet using OPTSIM software. In order to increase the users, a series-parallel network is preferred. In addition, the best performance will be achieved when using a longer wavelength (L-Band) 1600nm. By using this wavelength, the adverse effect of attenuation and dispersion can be minimized.

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