



OPTIMIZATION AND ANALYSIS OF WDM PON EDFA OPTICAL NETWORK WITH OPTIMIZED PARAMETERS

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ABSTRACT: The low noise, low bit error rate, and high bandwidth utilisation of the network have all contributed to the optical network's explosive growth during the last ten years. This work investigated the use of bandwidth with enhanced gain, reduced noise, and low bit error rate. Up to the second stage of the optical networks, this area had been the subject of prior research. Prior studies investigate the distribution of bandwidth between the two networks and explain how it is used. Also, they use several techniques to determine the many optimum characteristics, such as bit error rate, delay, gain, and low noise. Also, they use several techniques to determine the many optimum characteristics, such as bit error rate, delay, gain, and low noise. Nevertheless, this study examined the optical network up to its fifth stage, when the ideal parameters had been established by simulation. It also describes how optical networks may reuse capacity from one level to the next without adding a delay in between. This studied the potential of the next-generation optical network in the future and also clarified the various phases' modules.

Keywords: PON, WAVELENGTH, NGPON, OLT, ONU, EDFA, ETC.

INTRODUCTION

Optical communication systems transmission effectiveness is constrained by several factors, including attenuation, dispersion, nonlinearity, scattering, and others. The signals within the transmission link must be regenerated to account for all of these restrictions. Optoelectronic repeaters or optical amplifiers can be used for this. In the optical network optical regenerator basically used to convert the electrical signal to the optical signal then utilized according to the requirement of the optical network. This process of transmission is mostly very difficult and so much costly in the wavelength division multiplexing (WDM) Lightwave process. In the last decade, the exceptional growth of optical communication has been shown, in this day to day increasing the needs of users for the new applications and in the continuous advancements in the new technologies. The enlargement of WDM transformation has provided a practical answer to explore this challenge. In addition, to PON-WDM advancement, different optical network are directly passes at the same time separately utilizing non-covering carrier wavelengths using a sole fiber up to Gbps, which basically raises the enhancement of bandwidth in to the optical fiber

OPTICAL ACCESS NETWORKS

In optical access networks, users are asking for the additional services provided while other methods are carrying a wider variety of information traffic. It provides the necessary BW and reliable to full service wavelength administrations. Optical fiber provides the huge BW for the copper links. The potential BW of a single fiber has the range up to 50THZ. Additionally, it requires a little effort and has an incredibly low bit error rate (normally 10^{-12} , contrast with 10^{-6} in copper links. Therefore, it is the preferred method for information transmission across distances not more than one kilometer when the bit rate is more than megabits per second. It is actually the one of the best method for utilizing the short distances and fast (Gbps or more) interlinked inside the costly frameworks. Future further development in FTTH/B family units around the world is predicted. The European Commission financed, worldwide optical access systems for next-generation venture alluded to as Advanced Scalable Ring-based aloof Dense Access Network Architecture (SARDANA), and this is a European endeavor to lessen FTTH/B related expenses. The cost decrease in SARDANA is tended to through the presentation of the most recent innovative advancements that upgrade the execution of the FTTH/B access systems and limit foundation prerequisites. One of the deployment update goals forced by the

SARDANA consortium at the start of 2008 was the usage of the medium access control (MAC) standard that could bolster higher transmission rates than institutionalized P2MP FTTH/B arrangements.

BASICS OF OPTICAL ACCESS NETWORKS

WDM which originally developed to provides the optical fibers more capabilities in to the optical communication system into the existing system. So more precisely many system electrical hardware systems will be reduced and system components will be decreased or totally destroyed. Depending on the physical dimensions it is possible to divide the system into three different categorizes. Optical WDM systems undoubtedly, are the support system of present-day correspondence in light of their high throughputs having requests of Terabits per second (Tbps). They can fulfill developing applications, for example, video administrations, and medicinal imaging.

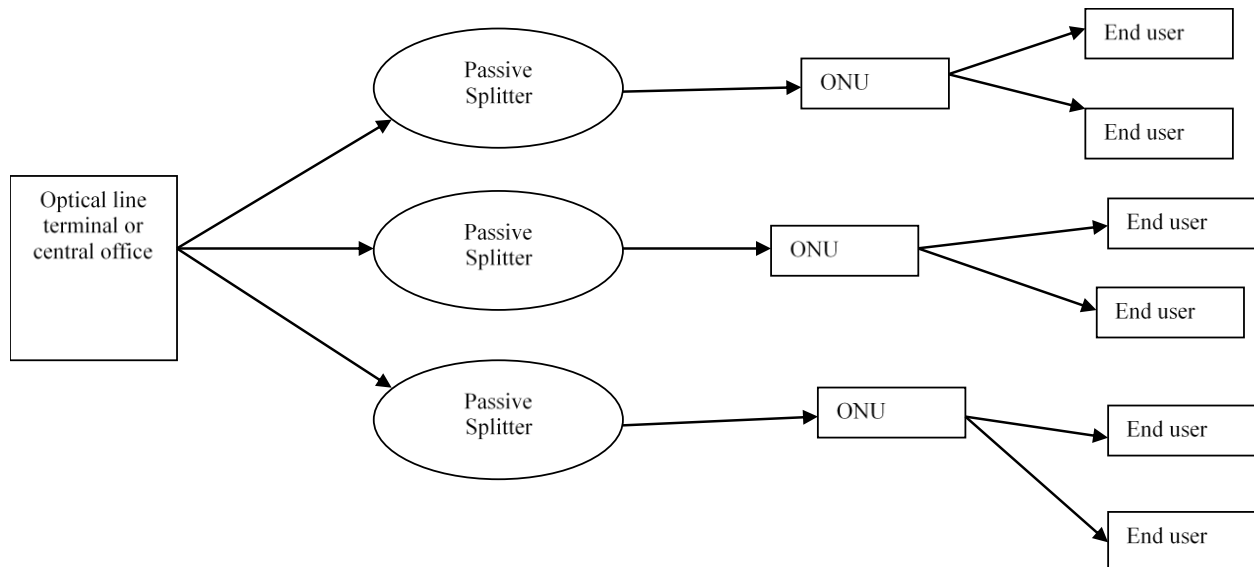


Figure1. Passive Optical Network

DIFFERENT CATEGORIES OF OPTICAL ACCESS NETWORK

IT provides the three different optical access networks:

1. Active Optical Networks
2. FTT – X Optical Networks

3. Passive Optical Networks.

Active Optical Networks: - In the AON use of electrically power changing device to provide the direct and more accurate transfer of the signal to the right user. For every subscriber, they used only one switch aggregator. It is defined through a having a single fiber that provide all traffic to a Remote Node (RN) near the ending clients from the CO. It is utilized as an Active ethernet framework because the equipment required providing the TV, communication, and the internet are associated through the fundamental ethernet standard.

FTT - X Optical Networks: - In this method require three typically utilized methods they can as follow:

- **Fiber – To – The – Curb:** In this the hardware is placed into the curb so this is one of the most common used technique for the services utilize into the particular region. In this the signal or data is present for the transportation through the copper. In this the area streamlines the costs, reduce the back feeding and lower dissemination cost is the ideal positron for the terminal.

- **Fiber –To – The – Buildings:** In this situated hardware with in a tower and it passes the BW near to a user.

- **Fiber – To- The – Home:** In this the optical fiber directly arrive to the user area.

Passive Optical Network: - The basic PON structure is presented here in which passive optical networks shows that the P2MP fibers direct connections to the home directly through the use of optical splitter. There are four different types of PONs will be explored further. PON is a originally created by **FULL SERVICE ACCESS NETWORK**, it is then standardized by the **ITU-T(INTERNATIONAL TELECOMMUNICATION UNIONELECOMMUNICATION)** and the **(IEEE) THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS**. PON involves three main parts.

- **Optical Line Terminal (OLT):** It is one of the most important part of PON which is arranged the main community to the central office. It provides the link between the PON and the support system.

- **Optical Network Unit (ONU):** It is very close to the users. It gives the link for the services to the end clients.

□ Optical Distribution Network (ODN): This is providing the link in between OLT to CO and ONU close to the client's area.

BLOCK DIAGRAM OF OPTICAL NETWORK

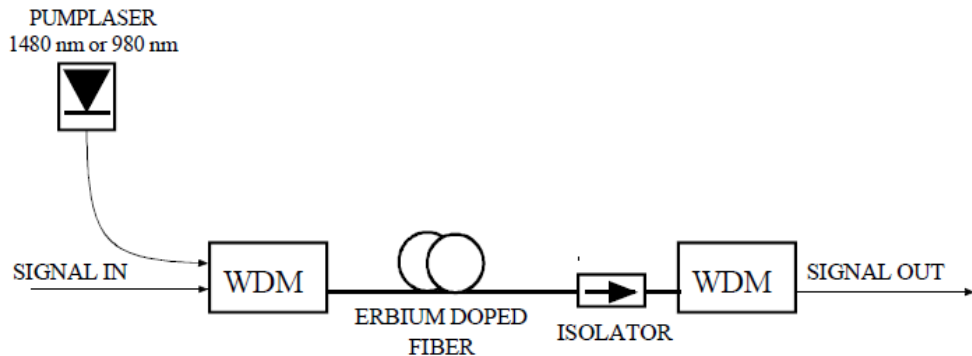
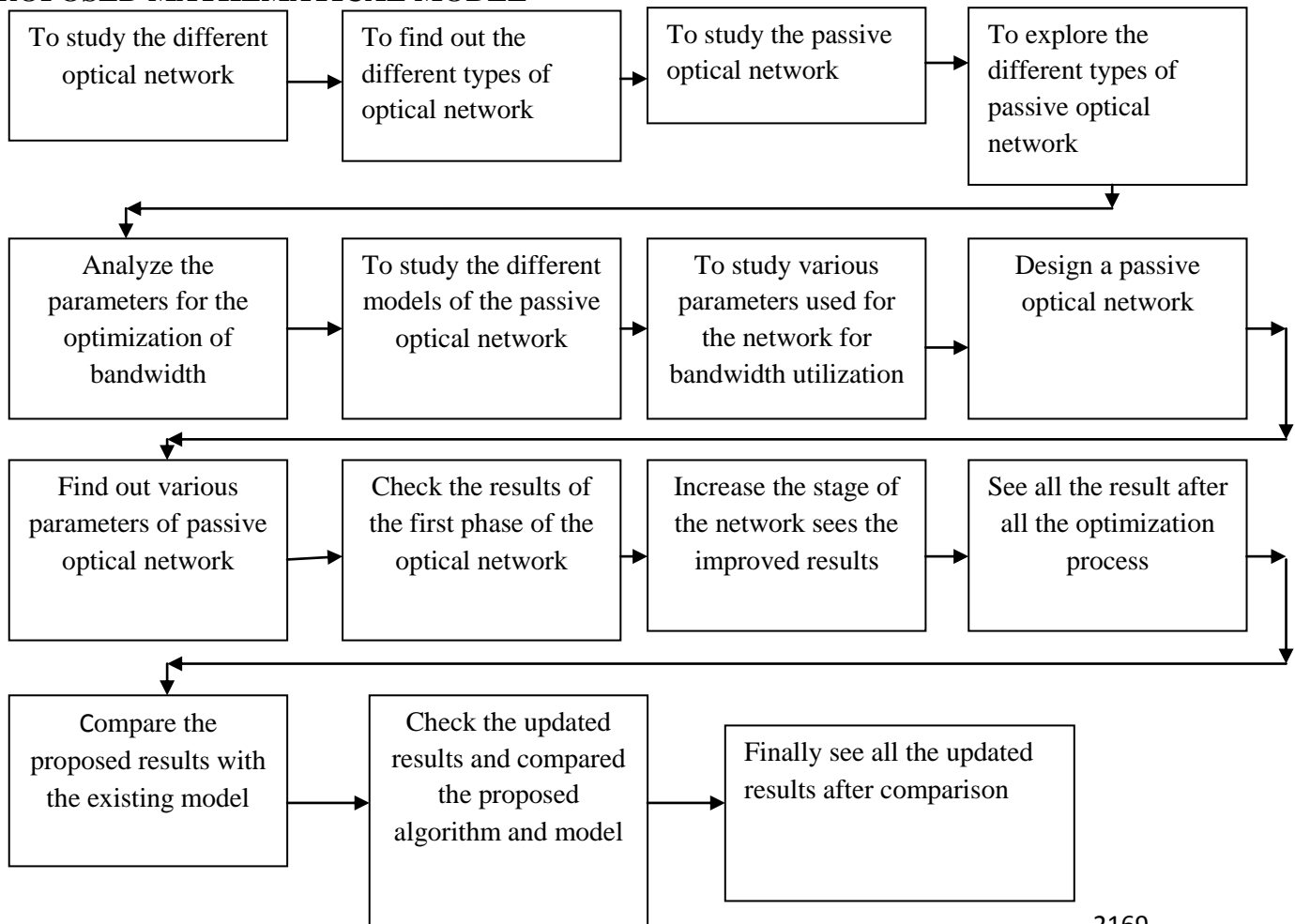


Figure 2. Block Diagram of The Optical network

PROPOSED MATHEMATICAL MODEL



DESIGNING OF THE OPTICAL NETWORK AND SIMULATION RESULTS

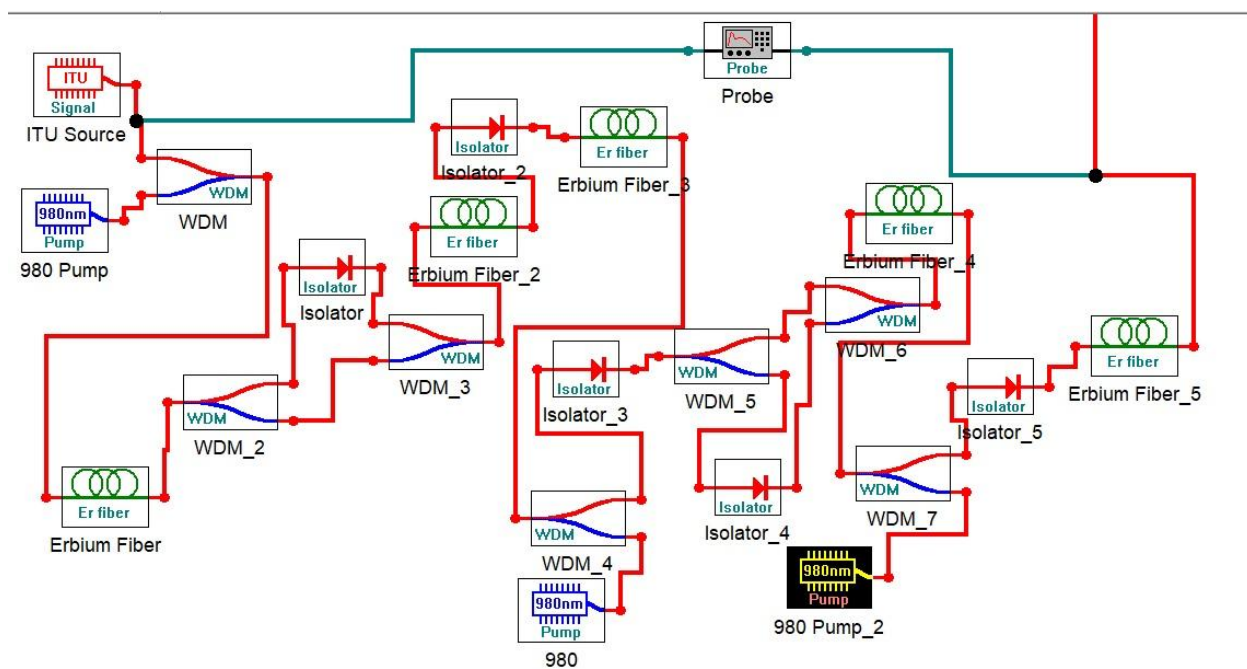


Figure 3: 5th stage of passive optical network

SIMULATION RESULTS AFTER FIFTH STAGE

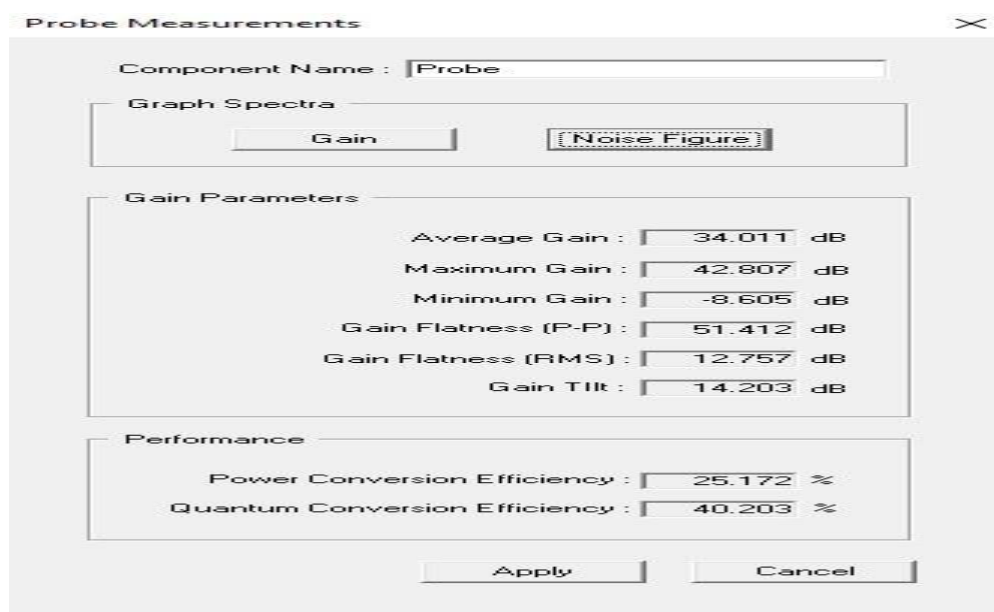


Figure 4: Simulations results

TABLE 1.1

SIMULATIONS RESULTS ALL THE STAGES

Sr. No	Optimum Parameter	Optical network (First Stage) results in dB.	Optical network (Second Stage) results in dB	Optical network (Third Stage) results in dB.	Optical net work (Fourth Stage) results in dB	Optical net work (fifth Stage) results in dB
1	Standard gain	27.801	30.099	32.531	33.929	34.011
2	Maximum gain	36.967	35.085	36.670	37.891	42.807
3	Minimum gain	23.487	22.742	21.389	19.248	8.605
4	Gain flatness(p-p)	09.480	10.343	17.281	18.656	21.412
5	Gain Flatness (rms)	1.586	2.972	3.973	5.086	12.757
6	Gain tilt	9.816	10.121	12.814	17.534	14.203

SIMULATION RESULTS OF OPTICAL WAVELENGTH

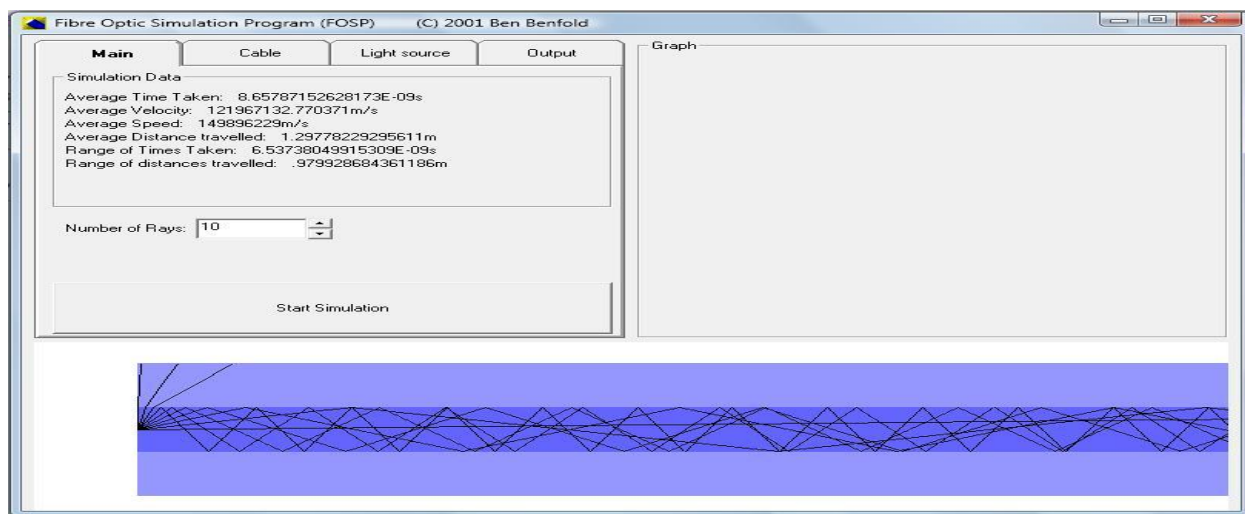


Figure 5: Optical Fiber Cable Results after Scattering

SUBSTANCES USED FOR THE OPTICAL FIBER

TABLE 1.2

Substance	Refractive Index
Air	1.0003
Ice	1.31
Liquid Water	1.33
Benzene	1.50
Crown Glass	1.52
Diamond	2.42

CONCLUSION:

We have proposed a five stage ASE input source with the multiple stages of the optical network by cascading the gain of the EDFAPON pumped with 980 nm and 1480nm laser sources with the input signal using erbium fiber. In this provide the 980 nm and 1480 nm with the broad bandwidth characteristics' .in this peak value is to be increased up to -35dB and gain bandwidth is obtained up to 95nm. so in this obtain a broader gain and higher bandwidth using multilayer stages with multilayer pumping technique. Such that we obtain the flat spectrum using DWDM device characteristics' and spectrum sliced DWDM systems.

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