

# Dispersion Compensation and Power Optimization using Multi Stage SOA in Association with DCF and FBG

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**Abstract:-** Now a day's optical communication is a popular technique to transmit the data. In daily life we share our useful data by using optical network. We face a common problem that is dispersion and power. Dispersion Compensating Fiber (DCF) and Fiber Bragg Grating (FBG) are widely used dispersion compensation techniques for optical communication systems. In proposed work we have Fiber optic frameworks are of the basis to advanced correspondence systems. The high transfer speed and information rates given by fiber optics can genuinely be used by work of WDM (wavelength division multiplexing) procedures. The WDM framework can take into account a superfluity of incorporated broadband administrations consolidating voice, information, video, mixed media administrations and VAS (Value Added Services). WDM framework long broadly utilized as a part of huge separation lines experiences issues, for example, a scattering and weakening which comes about corrupted framework execution. Scattering remuneration and optical power enhancement are basic parameters in WDM frameworks. This work is about the use of multistage SOA (Semiconductor optical Amplifier) framework to increase control and reduce scattering and accomplish higher SNR (Signal Noise Ratio). It is additionally basic that by position of EDFA pre and post FBG, consider a request of greatness increment in SNR and accomplish Phenomenal DC (Dispersion Compensation) in WDM frameworks.

**Keywords:** Optical fiber, DCF, FBG, WDM system, VAS, DC, multistage SOA, SMF, Optical power meter.

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## I. INTRODUCTION

### Optical fiber

In the next generation of light wave systems, high speed data rate like 10Gb/s or 40Gb/s per channel is very attractive. In addition, to pack more channels into one single fiber, channel spacing is decreased from 200 GHz to 50GHz or even smaller. The direct side-effect is that linear and nonlinear degrading effects will be severe in such high-speed light wave systems. The latest advancement needed urgently for reducing dispersion and power optimization, which transmits data and prepared for transmitting messages module onto light waves With uses glass (or plastic) strings (fibers) to transmit. [1]

### Wavelength Division Multiplexing

Wavelength division multiplexing (WDM) technology used in dispersion fiber communications which combine a number of optical carrier signals into a single optical fiber by using assorted wavelength (i.e. tones) of laser light. WDM techniques enhance the capacity and provide bidirectional communication. A WDM structure uses a multiplexer at the transmitter to unite the signs, and a demultiplexer at the receiver to part them isolated. With the right kind of fiber it is possible to have a device that do both at the same time and can fill in as an optical incorporate drop multiplexer. This is consistently done by usage of optical-to- electrical-to-optical (O/E/O) translation at the very edge of the vehicle sort out, thusly permitting cover operation with existing equipment with optical interfaces.

### Dispersion compensation Fiber (DCF)

DCF for dispersion compensation was proposed in 1980 but when optical amplifiers are invented DCF helps to reduce the dispersion. SMF have positive dispersion and DCF have negative dispersion so overall dispersion is zero. Electronic balance strategies are utilized as a part of technique. Since there is immediate recognition at the receiver, direct contortions in the optical space, e.g. chromatic scattering, are converted into non straight mutilation after optical - to-electrical change. It is because of reason that the idea of nonlinear channel demonstrating actualized. For this mostly bolster forward equalizer (BFE) and choice criticism equalizers (CCE) structures are utilized. EDC appears down the speed of correspondence since it backs off the computerized to analog conversation. [17]

### Fiber Bragg Grating (FBG)

FBG is a dynamic dispersion compensator. The FBG device is able to compensate chromatic dispersion at multiple variations of the wavelength. Therefore, it is the preferred solution for chromatic dispersion compensation. The chirped FBG is based on the principle of diffraction gratings. Bragg gratings actually have a periodic variation of refractive index within the propagating medium.. In this, Chirped fiber grating (CFG) is favored. CFG is a little all-fiber inactive gadget with low addition misfortune that is perfect with the transmission framework and CFG's scattering can be effortlessly balanced. CFG ought to be situated in-line for optical outcomes. This is the favored method due to its points of interest including little impression.. [2, 3]

### Optical Power Amplification Using SOA

Semiconductor optical Amplifiers (SOAs) are intensifiers which utilize a semiconductor to give the pickup medium. SOA is an opto-electronic gadget ready to increase the information optical power under certain ideal work conditions. The dynamic range inside the gadget increases the information flag. Outer electrical streams work as the vitality source empowering the last amplification of the optical power. The implicit waveguide restricts the information so it enters the dynamic zone. Be that as it may, the optical constraining is powerless and part of the flag "spills out" and is retained. The amplifier heads are intelligent which constitutes to the undulation of the enhancement range. SOA can be separated into two principle sorts. The Fabry-Perot SOA (FP-SOA) where the reflections from the end receptors are critical (i.e. the power experiences many increasing travels) thus called "travelling wave" SOA (TW-SOA) where the reflections are unimportant (i.e. power experiences just a single intensifying travel). Non-intelligent surfaces can be utilized to make SOA with head reflectivity under 10-5. TW-SOA is not as delicate as FP-SOA for variance of the inclination current, temperature and power polarization.

Data transfer capacity request rises, the development of optical parcel exchanging hubs focusing on optical switches would profit by quick optical switches. Semiconductor optical amplifier (SOA) innovation gives this fast exchanging capacity and additionally increase, high obliteration proportion, and high combination potential. Also, it is a key innovation for a few different capacities, including all-optical wavelength transformation, recovery, wavelength choice, supporter and in-line enhancement, in-hub optical pre-amplification, and mid-traverse eldritch reversal.

A SOA depends on an indistinguishable innovation from a Fabry-Perot diode laser. Such a laser comprises of an increasing medium situated inside a thunderous (Fabry-Perot sort) cavity. The amplification work is accomplished by remotely pumping the vitality levels of the material. Keeping in mind the end goal to get just the intensification work, it is important to secure the gadget against self-motions creating the laser impact. This is expert by blocking depression reflections utilizing both an antireflection (AR) covering and the procedure of edge dividing the chip features.

Dissimilar to erbium-doped fiber amplifiers (EDFAs), which are optically pumped, SOAs are electrically pumped by infused current.

The fundamental SOA comprises of a focal dynamic area around 600  $\mu\text{m}$  long and two latent areas at the information and yield sides of the chip, each around 100  $\mu\text{m}$  long. The focal dynamic layer depends on a different control hetero structure (SCH) and comprises of a 0.2- $\mu\text{m}$ -thick ductile mass dynamic layer installed between two 0.1- $\mu\text{m}$ -thick quaternary layers. It is decreased over a length of 150  $\mu\text{m}$ , which enables optical coupling to a fundamental detached waveguide. This kind of structure gives a high optical restriction calculate due to record

confuse between the layers in the pick up segment, together with an expansive spot estimate at the features for accomplishing a high chip-to-fiber coupling proficiency.

The key parameters required for a SOA include:

- Remaining reflectivity of under 10-4 to guarantee a pick up swell underneath 0.5 dB
- High fiber-to-fiber gain of 20 dB
- High material picks up to permit low-drive current operation (20 to 30 dB fiber-to-fiber pick up for a 100-Ma drive current)
- High yield immersion control, characterized as the yield control for which the pick up is diminished by 3 dB
- Chip-to-fiber coupling loss of less than 3 dB for each aspect, which is accomplished utilizing coordinated mode-extending decreased waveguides at the yield features.
- Polarization affectability of under 0.5 dB, in light of the fact that the polarization condition of the optical power originating from a connection fiber is typically arbitrary. Material pick up is isotropic in mass material, be that as it may, so polarization affectability (differential pick up between transverse-electric (TE) and transverse-attractive (TM) modes) as low as 0.3 dB can be accomplished with a close square (0.4  $\mu\text{m} \times 0.6 \mu\text{m}$ ) dynamic waveguide having nearly a similar control figure for both polarization states.

Every one of these attributes can't be all the while acquired, so bargains must be found. A quantum-well (QW) SOA structure will fulfill necessities for low remaining reflectivity and optical misfortune, and high material pick up. Then again, such a structure is inalienably polarization touchy, as TE mode picks up is more noteworthy than TM mode pick up. The impact can be decreased by joining compressively stressed QWs, which yield higher TE pick up and tractable QWs, which yield higher TM pick up. [4, 5, 6, 7]

## II. LITURATURE REVIEW

This article concentrates on the production of a sixteen-channel WDM (Wavelength Division Multiplexing) framework utilizing SOA (Semiconductor Optical Amplifier) at the speed of 10Gbps and the dispersing of 1nm. In making an optical system it is important to use programming devices reproducing a genuine optical system under the given conditions. Assessment of the optical line quality for the separate channel is performed on the premise of BER (Bit Error Rate). The aftereffect of the article is a WDM framework in a simulate domain assessing BER at specific stream in SOA. The wavelengths thought about were of 1549 nm and 1550 nm at draw current in the SOA: 0.05 A, 0.1 A and 0.2 A. The thought itself of wavelength multiplexing in optical correspondence was at that point hypothetically outlined and portrayed in the second 50% of the 1960s. However, the pragmatic application took after numerous years after the fact for the most part because of a weakness in the

innovation required for the get together. The primary research center transmission of two wavelengths in one fiber was effectively done in 1978 and as far back as then the WDM for viable application has been seriously created and enhanced. Presently the WDM frameworks are a typical piece of the foundation of transmitting innovations and one optical fiber transmits tens or up to several optical signs isolated from each other by various wavelengths. The entire WDM chain comprises of n optical sources and locators where for each utilized wavelength the transmitter regulates the transmitted power. The point of this article was to find the ideal direct current in SOA in a WDM framework in light of the BER for the individual channel. Negligible bit error rate required for a line is 10<sup>-12</sup> for optical correspondence frameworks. In the reproduction with SOA draw current of 0.05 A, the estimation of BER was demonstrated deficient in the collectors RX-2 and RX-3 as the BER vacillated around 10<sup>-5</sup>. At a draw current of 0.1 A the BER for the recipient RX-2 demonstrated satisfactory for utilization in optical correspondence as its esteem was 10<sup>-12</sup>. While expanding the current in SOA to 0.2 A the BER deteriorated to 10<sup>-4</sup>. As indicated by hypothetical information and recreation tests it was conceivable to utilize a draw current of 0.1 Amp. in SOA for the four-channel WDM framework with separating of 1 nm in C band. [8]

We tentatively show interestingly a bidirectional transmission up to 60-km of a 16-channel-WDM-PON at 10-Gb/s. An optical-spending plan more than 30-dB was gotten. This depended on self-seeded RSOAs and multi-level-tweak of RF signals.

We have exhibited a self-seeded RSOA answer for WDM engineering where multi-level adjustments were connected to a low transmission capacity RSOA by FDM flag. We have acquired a bidirectional transmission at 10 Gb/s over 60 km with an optical spending plan of 30 dB. The blend of FDM and WDM into a FWDM-PON in view of self-seeded system guarantees for a savvy and adaptable gadget for high rate transmission for the next generation optical get to systems.

The way toward imparting utilizing fiber optics includes the accompanying fundamental strides: The optical power is made utilizing a transmitter, the power is transferred along the fiber, the power is guaranteed that it doesn't turn out to be excessively contorted or powerless, the optical signal is gotten and changing over it into an electrical signal. The chromatic scattering in optical fiber is a marvel caused by the diverse wavelength which relies on upon its gathering refractive record which causes Pulse expanding as they propagate in OFC. In spite of the fact that EDFAs (Erbium doped fiber amplifiers) repay the transmission misfortunes, Chromatic scattering is not repaid utilizing EDFAs. One of the appropriate and vital parts in optical correspondence framework is Fiber Bragg Grating (FBG). Uniform FBG is contemplated as a scattering compensator in any optical correspondence framework. The test system utilized is

OPTISYSTEM 7.0 re-production programming. Every one of the recreations is done in OPTISYSTEM 7.0 at 10Gbits/sec and 210 km of transmission fiber. The recreated transmission framework has been broke down on the premise of various parameters such as BER, Q-calculate, Output control, Gain, Noise Figure and Eye tallness.

In this paper, we have simulated an optical transmission framework. When we watched scattering, we choose to repay it. For this reason, we utilized uniform FBG and reenact it. The framework has been examined for with and without FBG grating and apodization capacities. We have break down that uniform FBG gives better outcomes for yield energy of optical fiber at 10Gbits/sec. For a long separation optical correspondence framework the scattering in optical fiber confines the execution. By the utilization of fiber Bragg grating the scattering is adjusted. The utilization of fiber Bragg grinding upgrades the bit error rate and the Q-calculate. We can infer that the uniform fiber Bragg grating gives better Q-variable and Bit error rate than without FBG. In future this can be utilized for long separation optical correspondence with high information rates and low misfortune. [9]

A long reach and band width diminished radio over fiber design in light of self stage weak is exhibited for duplex correspondence to serve radio get to units (RAUs). A duplex design that worked on rate of 1 Giga bits for every second has been checked and pondered on execution parameters. Most extreme work is expert to communicate information from focal office (CO) to versatile base station more than 40 Km SMF-28 and from base station (BS) to radio get to units over the fiber extend of 300m. Work is done to satisfy the requests of future era fast portable correspondence frameworks that provide food various RAUs at delayed separations. Band width diminishment effectiveness is examined for scattering remuneration fiber and fiber boast gratings in the proposed engineering. A notable normal for intelligent semiconductor optical amplifier is squeezed into administration to convey information speed and savvy frameworks. Raman semiconductor optical amplifier (RSOA) serves the upstream radio get to units and limits the cost of ROF framework.

Bidirectional radio over fiber transmission of signs over rational bandwidth self stage balance dependent optical bearers era has been illustrated. Signs were transmitted at the aggregated pace of 1Gbps in duplex RoF framework. This work has concentrated on the practical way to deal with create and convey motions in RoF design. We proposed a helpful and also skillful plan through the joining of nonlinearity based self stage adjustment, to slice the use and to offer a long achieve framework. Significant corruption in the RoF correspondence which constrains the achievement of delayed separation transmission is because of signal expanding and between image impedance. It is watched that framework works for 50Km with great quality when DCF is joined in the

framework. Correlation uncovered that FBG is utilized for PWR yet DCF performs better than FBG. [10]

With the disclosure of optical fiber there was an across the board unrest in the field of correspondence. Optical fiber correspondence offers high information rate, security, adaptability, higher data transmission and so on. However variables, for example, scattering, weakening, dissipating and so on, enormously hamper its execution. In addition it's scattering that extremely harms the fast information transmission in optical fiber. Scattering makes the bandwidth spread as it goes along the fiber and causing obstruction. There are different strategies for scattering pay. This examination is done to underline the impact of scattering and how to defeat it by utilizing FBG. Fiber Bragg Grating is one of the broadly utilized advances to repay scattering in optical fiber correspondence and here we have utilized FBG to remunerate scattering in a 80Gb/s WDM organize utilizing NRZ modulator at transmitter side and the outcomes in this manner acquired are thought about. The estimation of Q-component, eye tallness and bit error rate (BER) is resolved for every last channel and their esteems are looked at. In view of the examination, the transmission framework has been planned which comprises of laser light as the source, modulator, single mode optical fiber as the channel, Fiber Bragg grating (FBG) as the scattering compensator at that point, the optical transmission. [11]

The most regularly utilized scattering pay fiber (DCF) innovation is considered. Three plans (Pre-compensation, post-remuneration, blend pay of Dispersion Compensation strategies for 40 Gb/s non-come back to Zero connection utilizing standard and scattering repaid fiber through FBG compensator to upgrade high information rate optical transmission. Goal is to build the quality variable, fiber length and better educational in eye chart utilizing distinctive adjustments procedures. The re-production results are approved by investigating the Q-element and Bit error Rate (BER) in the numerical simulator. A fiber boast grating (FBG) is a standout amongst the most critical and appropriate segment in an optical correspondence framework. The utilization of trilled FBG has been contemplated as a scattering compensator in an optical correspondence framework. The recreation Results are approved by investigating the Q-calculate .According to test, when Q=6, the BER is around 10-9; when Q=7, the BER is around 10-12. Input power is taken as 9-10 db, The corresponding BER is better. It is watched that the symmetrical-pay conspire performs superior to anything pre-, post-compensation plans for 8x40 Gb/s WDM framework. It is watched that the remuneration plans diminished the scattering suitably yet among post pay conspire lessened the aggregator fiber chromatic scattering to the most extreme conceivable develop to direct lesser estimation of fiber Bragg grating scattering and greater estimation of laser normal power is good to the execution of the transmission

framework. It can be understood that the signal was expanded and its energy is expanded subsequently of increment in the peep parameter which is the best volume. We have break down the 8 channel WDM framework at 40Gbps for various scattering pay plans utilizing DCF. We watched that the symmetrical-pay plot performs superior to the pre and post-remunerations plans. [12].

### III. METHODOLOGY

#### Introduction of Optic system

For simulation and designing we use optic system 7.0, it is an innovative, rapid developing, convient and powerful software design tool. It helps the users to test and simulate almost all kinds of optical fiber links. The arrangement and examination of these systems, which commonly use nonlinear devices and non-Gaussian disturbance sources, these endeavors would now be able to simply be performed capably and feasibly with the help of forefront new programming gadgets. OptiSystem is an imaginative optical correspondence structure reenactment package that blueprints, tests, and advances in every way that really matters any kind of optical association in the physical layer of a far reaching scope of optical frameworks, from basic video broadcasting systems to intercontinental spines. OptiSystem is a stay singular thing that does not rely on upon other amusement frameworks. It is a structure level test framework in light of the viable showing of fiber optic correspondence systems. It has a proficient new propagation condition and a different leveled significance of sections and systems. Its abilities can be produced easily with the development of customer parts, and can be faultlessly interfaced to a broad assortment of mechanical assemblies. A broad Graphical UI (GUI) controls the optical part arrangement and net list, fragment models, and presentation representations (see Figure 1). The expansive library of dynamic and dormant sections joins down to earth, wavelength-subordinate parameters. Parameter clears empower you to analyze the effect of particular contraption particulars on system execution. Made to address the necessities of research analysts, optical telecom engineers, system integrators, understudies, and a wide grouping of various customers; OptiSystem satisfies the demand of the impacting photonics promote for a proficient and easy to-use optical structure design instrument.

Optic Framework is an extensive programming plot suite that engages customers to mastermind, test, and duplicate optical associations in the transmission layer of present day optical frameworks.

Optic Framework is a broad programming diagram suite that engages customers to mastermind, test, and reproduce optical associations in the transmission layer of current optical frameworks.

A broad Graphical UI (GUI) controls the optical part configuration and net list, portion models, and presentation plans.

Optic Framework considers the arrangement computerization of in every practical sense any sort of optical association in the physical layer, and the examination of a broad scope of optical frameworks, from Entire arrangement Systems, Metropolitan Region Systems (Keeps an eye on) and Neighborhood (LANs). Optic Framework consolidates an expansive library of test optical diagram (.osd) records that can be used as configurations for optical arrangement wanders or for taking in a show purposes. Optic Framework limits can be connected with the development of customer parts, and can be faultlessly speak with a broad assortment of gadgets. [1,13,14,15]

**Proposed System Implementation In Optisystem  
 Single stage SOA without FBG**

In single stage we used a SOA to amplify signal and then used single mode fiber to transmit 5km signal and last we connect a DCF to compensate the signal. And connect the optical power meter with SOA to show the power of signal at SOA.

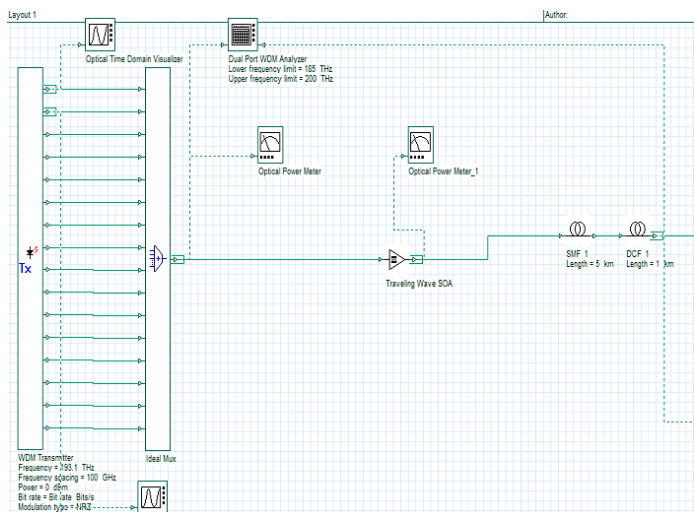


Fig:1 Proposed System Architecture of single stage SOA without FBG

**2. Single stage SOA with FBG**

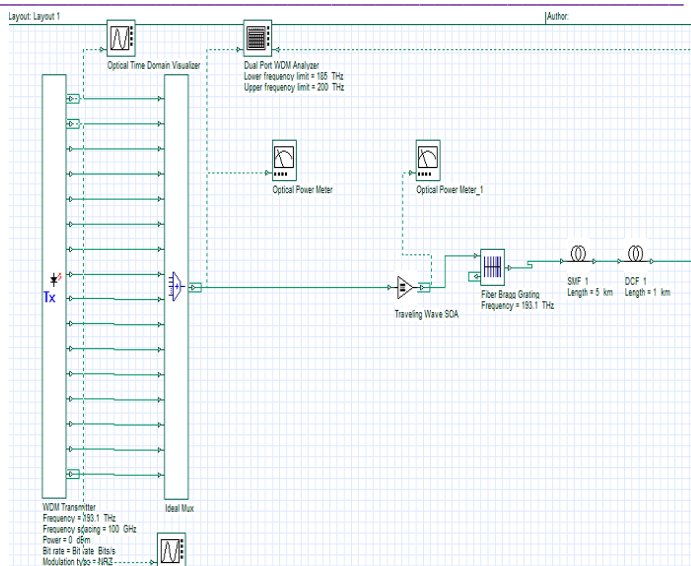


Fig. 2 Proposed System Architecture of single stage SOA with FBG

In single stage SOA with FBG system we used a SOA which amplify the WDM signal and then used the FBG which is compensate the signal and then used single mode fiber to transmit the signal and then used DCF to again compensate the signal. Its result is good compare to single stage SOA without FBG.

**3. Multi stage SOA with FBG**

In multi stage SOA with FBG first we used a single mode fiber to transmit the signal and then used DCF to compensate the signal and then used SOA to amplify the signal and then used the FBG to again compensate the signal. First stage is complete now starts the second stage. In second stage we used SMF to transmit the signal and DCF to compensate the signal and then signal amplify by SOA. Again second stage is repeated and then first stage is repeated. And then we find out the result. The result is very good as compare to single stage SOA without FBG and with FBG system.

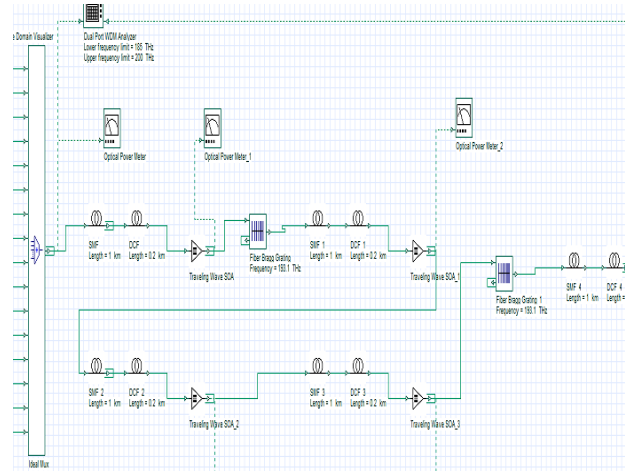


Fig: 3 Proposed System Architecture of multi stage SOA with FBG for 5KM

**IV. RESULT**

In this paper, we proposed that we need to depict that contrasts between single stage SOA and multistage SOA for optical fiber enhancement. What's more, need to demonstrate that why multistage SOA is superior to single stage SOA without FBG and single stage SOA with FBG. In an optical fiber correspondence framework optical signs are transmitted through the optical fiber. At the point when transmitted over long separations, the optical power is exceedingly mutilated. To anticipate power debasement over long separation correspondence optical amplifiers are utilized. SOA is utilized as an optical enhancer in correspondence for better execution. To enhance the execution of the speaker arrange multi pass and multi organize SOA designs are utilized.

In this section, we will get come about with utilizing single stage SOA and single stage SOA with FBG and multistage SOA in optisystem 7.0, and will get contrasts between them three.

As a matter of first importance, for single stage SOA.

**Single stage SOA without FBG**

The product Optisystem is utilized to outline the SOA in the WDM framework. The framework comprises of 16 info signals (channels), a perfect multiplexer, Single mode fiber, a pump laser, semiconductor optical amplifier and DCF, demultiplexer, photograph finder PIN, low pass Band channel as appeared in Figure. The contribution of the framework is 16 evened out wavelength multiplexed motions in the wavelength locale of 193.1Thz with 100Ghz channels dispersing.

In single stage SOA without FBG case, when the signals go through from perfect mux, the perusing will on first optical power meter. The figure 4 demonstrates that estimation of

signs on beginning of this operation. This is the primary meter to take note of the estimation of transmitted power. It is called additional optical transmitter. Then signal is transmitted to SOA and the optical power meter 1 is connected to read the power of signals after amplify. Then signal transmitted to DCF through the single mode fiber.

In this system input power is 8.71mW and output power after amplify the signals is 115.90mW.

**Single stage SOA with FBG**

In single stage SOA with FBG case, when the signs go through from perfect mux, the perusing will on first optical power meter. The figure demonstrates that estimation of signs on beginning of this operation. This is the primary meter to take note of the estimation of transmitted power. It is called additional optical transmitter. Then signal transmitted to SOA and the optical power meter 1 is connected to read the power of signals after amplify. Then signal transmitted to FBG where signal compensate and transmit to DCF through the single mode fiber. DCF again compensate the signal and forward to again FBG.

Table 1: Value of signals in single stage SOA without FBG

Serial number	Length	Input Power	After SOA	Output Power
1	5km	8.71mW	115.90mW	82.9mW
2	7km	8.71mW	115.90mW	72.51mW

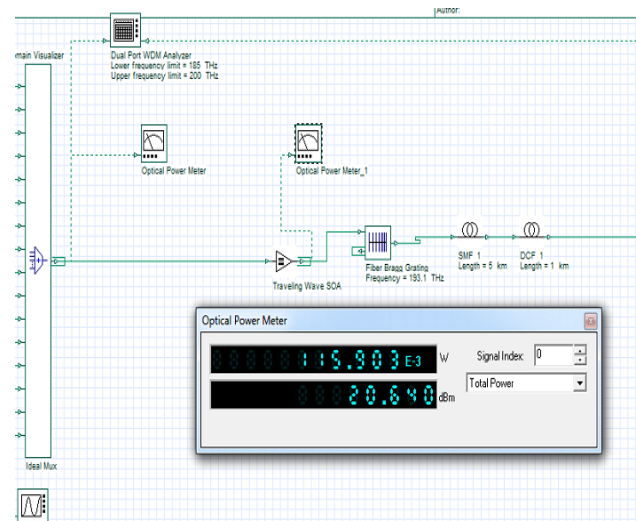


Fig 4: Optical Power Meter Reading

In this system input power is 8.71mW and output power after amplify the signal is 115.90mW, and after FBG 1 power is 81.26mW.

Table of single stage SOA value of received data on each optical power meter

Table 2: Value of signals in single stage SOA with FBG

Serial number	Length	Input Power	After SOA	Output Power
1	5km	8.71mW	115.90mW	81.26mW
2	7km	8.71mW	115.90mW	71.075mW

**Multi Stage SOA**

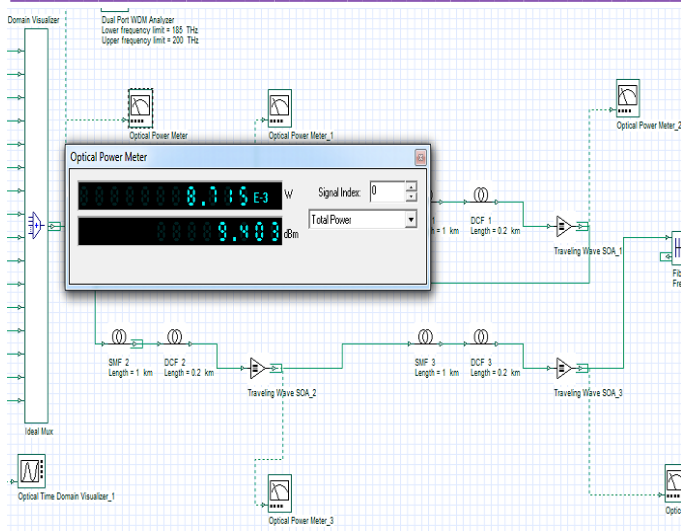


Fig 5: Optical Power Meter Reading

In multi arrange SOA case, when the signs goes through from perfect mux, and the signs which gone from perfect mux, the estimation of signs will be on first optical power meter. The figure demonstrates that estimation of signs on beginning of this operation. This is the main meter to take note of the estimation of transmitted power. Additionally called likewise optical transmitter. And the first reading on optical power meter will be as shown figure.

Table 3: Value of signals in multi stage SOA with FBG

Serial number	1	2
Length	5 km	7 km
Input Power	8.71mw	8.71mw
After SOA	144.90 mw	114.078 mw
After SOA1	220.03 mw	218.233 mw
After SOA2	327.0 mw	345.514 mw
After SOA3	435.96 mw	429.713 mw
OutputPower After FBG	404.26 mw	388.134 mw

In this system we used five SMF of 1km and five DCF of 0.2km and 4 SOA and 2 FBG. First signs pass through single mode fiber and recived by DCF, DCF compensate the signs and transmit to SOA, SOA amplify the signs and send to FBG,FBG compensate the signs and again forward to SMF,DCF and SOA. After SOA signs forward to SMF,DCF and SOA and again signs pass through the SMF DCF and SOA after SOA signal pass by FBG and SMF,DCF and finally output is comeout.

## V. CONCLUSION AND FUTURE SCOPE

### CONCLUSION

As shown above, Results were found successfully after implementing proposed work in OptiSystem simulation environment. we conclude that for long distance communication dispersion compensation and power optimization is necessary.

Present study shows the acceptable quality of results. As warranted, the proposed design is able to give superior signal to noise ratio (s) and noise figure (dB) as compare to single stage SOA using with same input. As there is a significantly rise in optical power as compared to single stage SOA. Strategic placement of multistage SOA, pre and post FBG, also enhance the some optical power output . As shown there is an average implement of dB, in noise figure and mW in terms of optical power as proved by the result.

Table4: comparison between single stage SOA, single stage SOA with FBG and Multi stage SOA

Single stage SOA	Received power (mW)	82.9	72.51
	Avg. gain	9.646	9.059
	Avg. Noise Figure	-9.646	-9.059
	Output OSNR(DB)	106.88	106.29
Single stage SOA with FBG	Received power (mW)	81.26	71.075
	Avg. gain	9.55	8.973
	Avg. Noise Figure	-9.55	-8.973
	Output OSNR(DB)	106.79	106.22
Multi stage SOA with FBG	Received power (mW)	300.43	299.134
	Avg. gain	15.89	15.427
	Avg. Noise Figure	-15.89	-15.427
	Output OSNR(DB)	113.138	112.667

After completed the project we comprised between single stage SOA, single stage SOA with FBG and multi stage SOA system output. Finally we are concludes the multi stage SOA is the best in all models. In multi stage SOA the avg. gain, received power and output noise ratio is high as compare to other and noise figure is low as compare to other.

## VI. FRUTURE SCOPE

WDM system is the life line of modern day optical fiber network. As depicted by our work, use of multistage SOA in comparison to single stage. SOA can provide for significant gains in terms of noise figure and optical power. This improve the performance once of a WDM system considerably as this is progressing research avenue, a lot more is required to cater the ever increasing bandwidth demand. Use of fives grating fibers can provide highly effective dispersion compensation. Also ongoing researches in optical amplifier via enhance SOA to use more sophisticated martial and component either than SOA. Another research avenue is use of nanotechnology for building loss less optical amplifier. With the gamut of these new technologies on the verge to be introduce, we will see a lot happening in this decade. [12,13,16]

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