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Enhanced WDM-OFDM-PON System Based on Higher Data Transmitted with Modulation Technique

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ABSTRACT:- *Studies among the field communication system existing technique and proposes and by experimentation demonstrate a multiuser wavelength-division-multiplexing passive optical network (WDM-PON) system combining with orthogonal frequency division multiple (OFDM) technique. A tunable multiwavelength optical comb is intended to provide flat optical lines for helping the configuration of the multiple source-free optical network units WDM-OFDM-PON system supported normal single-mode fiber (SSMF). In WDM based on fiber, optical network communications using wavelength with multiplex or demultiplex may be a technology that multiplexes a variety of optical carrier signals onto one fiber by victimization completely different wavelengths of optical device lightweight. this system allows bidirectional communications over one strand of fiber, also as multiplication of capability and calculate BER (Bit Error Rate) and OSNR (optical signal noise ratio) finally; a comparison of by experimentation achieved receiver sensitivities and transmission distances victimization these receivers is given. The very best spectral potency and longest transmission distance at the very best bit rate. WDM based applications like transmission data, medical imaging data, and digital audio data and video conferencing data are information measure-intensive with the Advance in optical technology providing verdant bandwidth, it's natural to increase the multicast construct to optical networks so as to realize increased performance. Our projected scheme (PGA) based on information load transmitted capability improve supported higher information transmitted over these channels and high data up to develop in Matlab tool and using optical Interleaved the OFDM model and analysis the performance of the WDM-PON system.*

Keywords- Wireless Network, Passive optical network (PON), source-free ONUs, optical comb, wired and wireless hybrid system. BER, OSNR, Wireless Fidelity, Binary Phase Shift Keying, QAM.

I. INTRODUCTION

The idea of multicast has been widely studied in traditional packet-switched networks. Multicast applications like transmission, medical imaging, and digital audio and video conferencing demand large information measure support. The advance in WDM (wavelength division multiplexing) technology provides the provision of huge bandwidth, probably fifty bps. It's natural to increase the multicast idea to optical networks so as to achieve increased performance. As bandwidth-hungry applications have become widely adopted, the network traffic demand is incessantly growing. However, this increase within the transported bits isn't mirrored within the revenues of the network operators since the common revenue per user (ARPU) remains fairly flat. As a result, there's AN increasing pressure to drive down the common price per transported bit. Historically, the pressure to drive down network prices was transferred to the network instrumentation vendors resulting in needs for price economical instrumentation and network architectures. Recently, the idea that the spectrum needs cause no restriction has been challenged. there's a growing awareness that the physical capability of the fiber is speedily approaching its most limit, The term "flexibility" in optical networks refers to the power of the network to dynamically change its resources (wavelength channels, bandwidth, transmission format, data rate, etc.) in AN optimum and elastic manner consistent with the continual varied traffic conditions (traffic churn) and demands, whereas taking into thought the standard of Transmission (QoT) requests of the each the pre-established and new assigned. Connections. Recent advances in optical orthogonal frequency division multiplexing (OFDM), [1]

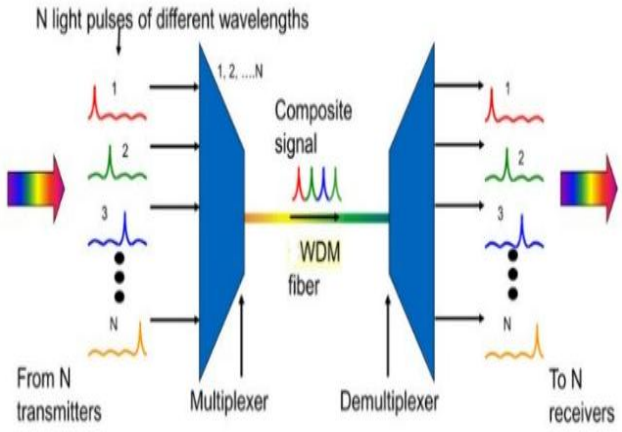

Fig1: WDM Network Architecture

New technologies are needed to be developed so as to realize high capability and tunable transport. As the spectrum is changing into a scarce resource, it's particularly vital to attain these targets at the best potential spectral potency. A primary step towards this direction is that the readying of multi-level modulation formats victimization polarization multiplexing, that reaches high spectral potency [2]. A recently planned resolution is predicated on combining multiple tightly spaced channels, which may assume such multi-level

modulation formats. These multiple tightly spaced channels type super-channels giving tunable bit-rates within the terabit per second vary. The channels forming the super-channels are mentioned as subcarriers within the following the bit rate of such systems depends on the subcarriers modulation format, the image rate, the FEC and the number of subcarriers. Thus, further degrees of freedom are offered, that support reasonableness in terms of the bit rate and reach. Wavelength-division multiplexing (WDM) is an associate approach that may exploit the large optoelectronic information measure pair by requiring that every end-user's instrumentation operate only at an electronic rate, however, multiple WDM channels from totally different end-users are also multiplexed on identical fiber. Under WDM, the optical transmission spectrum (see Fig. 2) is graven up into a variety of non-overlapping wavelength (or frequency) bands, with every wavelength supporting one communicating operational at no matter the rate one wishes, e.g., peak electronic speed. Thus, by permitting multiple WDM channels to be on one fiber, one will tap into the large fiber information measure, with the corresponding challenges being the planning and development of applicable network architectures [3].

Modulation Techniques

Binary section shift keying: In BPSK, the section of a seamless amplitude carrier is switched between 2 values to keep with the two potential signals funds and M2 love binary one and zero severally. This modulation is that the foremost durable of all the PSKs since it takes the foremost effective level only ready to modulate at one bit/symbol of noise or distortion to create the rectifier reaches an incorrect call. It is, however, and then is unsuitable for prime data-rate applications. BPSK functionally adores 2-QAM modulation. The BPSK signal is analogous to a double sideband suppressed carrier amplitude modulated wave. Therefore a BPSK signal is sometimes generated using a balanced modulator. Reception in BPSK Receiver needs the reference of transmitter signal thus on properly modification section, thus it's necessary to transmit carrier aboard signal. It needs difficult and expensive receiver equipment. It offers good BER for low SNR giving power potency.QPSK - construction section Shift Keying: construction section Shift Keying has doubled the information live efficiency of BPSK. For each single modulation image, 2 bits are transmitted. The section of carrier takes on four equally spaced values like zero, π/2, π, 3 π/2. The two modulated signals, every of that may be thought-about to be a BPSK signal, area unit summed to supply a QPSK signal. QPSK transmitters and receivers are more durable than those for BPSK. However, with fashionable physical science technology, the penalty in value is unbelievably moderate. Like BPSK, there are section ambiguity problems at the receiving finish, and differentially encoded QPSK is typically used in follow E [4].

Optical change and DWDM Basic operate

Based on totally different applications, WDM optical change networks may be classified into 2 affiliation models: the wavelength-based model and therefore the fiber-link-based model, betting on whether or not one device connected to the change network occupies one input/output wavelength or one input/output fiber link. Below the wavelength primarily based model, every device occupies one wavelength on AN input/output fiber link of a WDM optical change network. Beneath the fiber-link-based model, every device occupies a complete input/ output fiber link (with multiple wavelength channels) of a WDM optical change network. These 2 models are utilized in differing types of applications. Within the former, every device might be AN independent, easy device that wants just one channel, and within the latter, every device might be a lot of refined one with multiple input/output channels, like a network processor capable of handling simultaneous, independent packet flows, for instance, MMC Networks NP3400 processor and Motorola's C-port network processor. Also, some hybrid models are potential, e.g. adopting the wavelength-based model on the network input aspect and therefore the fiber-link-based model on the network output aspect. As may be expected, a change network with a wavelength-based model has stronger association capabilities than that with a fiber-link-based model; however, it's higher hardware value. Additionally, the communication patterns realizable by AN optical change network may be classified into permutation (one-to-one), multicast (one-to-many) and then on. [5]

II. EXISTING WORK

Xue et al. [6]. During this paper, we tend to propose and through an experiment demonstrate a multiuser wavelength-division-multiplexing passive optical network (WDM-PON) system combining with orthogonal frequency division multiple (OFDM) technique. A tunable multiwavelength optical comb (MOC) is meant to produce flat optical lines for helping the configuration of the planned multiple source-free optical network unit's increased WDM-OFDM-PON system. Schematized by cascading a part modulator associate degreed an intensity modulator with a recirculation loop, the MOC will output twenty-nine ideal channel optical comb lines with the flatness of zero.85 dB. For the MOC enabled WDM-OFDM-PON system, source-free and interference-free multiuser upstream transmission over one fiber will be with efficiency supported, whereas downstream transmission channels will convey the baseband information stream and frequencies OFDM signals at the same time in order that the planned system will be connected to wire-line users and wireless users at the same time

Luo et al. [7] The next-generation passive optical network stage two (NG-PON2) effort was initiated by the complete service access network (FSAN) in 2011 to

analyze oncoming technologies enabling an information measure increase on the far side ten Gb/s within the optical access network. The FSAN meeting in Apr 2012 selected the time- and wavelength-division multiplexed passive optical network (TWDM-PON) as a primary answer to NG-PON2. During this paper, we tend to summarize the TWDM-PON analysis in FSAN by reviewing the fundamentals of TWDM-PON and presenting the world's initial full-system forty Gb/s TWDM-PON example. When introducing the TWDM-PON design, we tend to explore TWDM-PON wavelength set up choices to fulfill the NG-PON2 needs. TWDM-PON key technologies and their various levels of development area unit more mentioned to analyze its practicableness and availableness. The first full-system forty Gb/s TWDM-PON example is incontestable to supply forty GB/s downstream and ten Gb/s upstream information measure. This full example system offers a thirty-eight-decibel power budget and supports a twenty-kilometer distance with a 1:512 split quantitative relation. It coexists with commercially deployed Gigabit PON (G-PON) and ten Gigabit PON (XG-PON) systems. The operator-vendor joint check results testify that TWDM-PON is realizable.

Tomkos et al. [8] there's a growing awareness that the user information measure of deployed fiber is speedily approaching its most limit. Given the likelihood for such capability crunch, the analysis community has targeted on seeking solutions that create the foremost out of the scarce network resources (such because the fiber bandwidth) and permit accommodating the ever-increasing traffic demands. In such a context, new spectrum economical optical networking techniques are introduced as to how to supply economical utilization of the offered optical resources. "Flexible", "elastic", "tunable", "gridless" or "adaptive" area unit few samples of the terms employed in literature to explain solutions that migrate from the mounted WDM single-line rate systems to systems that offer support for the foremost economical information measure utilization. During this paper, we tend to review the recent developments on the analysis topic of flexible/elastic networking and that we highlight the longer-term analysis challenges.

Ding et al. [9] Multicast applications like transmission, medical imaging, digital audio, and video conferencing area unit bandwidth-intensive. With the advance in optical technology providing galore information measure, it's natural to increase the multicast thought to optical networks so as to realize increased performance. This paper provides a comprehensive review of optical multicast techniques, covering the most optical multicast thought, the optical multicast switches, and the multicast over single-hop broadcast-and-select networks, the multicast over multi-hop wide space mesh networks, and therefore the connected difficult algorithms developed for multicast routing within the optical domain.

M Borthakur et al. [`10] Explosive data demand within the internet world is making huge desires for capability growth within the next-generation telecommunication networks. It's expected that the info homeward network traffic can double per annum. Optical networks are widely considered the last word answer to the information measure needs of future communication systems. Fiber links deployed between nodes are capable to hold terabits of knowledge however the electronic change at the nodes limits the information measure of a network. Optical switches at the nodes so overcomes this limitation. With their improved potency and lower prices, Optical switches give the key to each manage the new capability Dense Wavelength Division Multiplexing (DWDM) links additionally as gain a competitive advantage for provision of latest band dimension hungry services. However, in AN optically switched networks, the challenge lies in overcoming signal impairment and network-connected parameters. During this paper, the current standing, benefits and challenges and future trends in optical switches has been mentioned. nowadays fibers are pure enough that a light-weight signal will travel for regarding eighty kilometers while not the requirement for amplification. However, at some purpose, the signal still has to be boosted. Physics for amplitude signals were replaced by stretches of fiber infused with ions of the rare-earth erbium. Once these erbium-doped fibers were zapped by a pump optical maser, the excited ions might revive a weakening signal. It restores a symbol with none optical to electronic conversion and might do thus for terribly high-speed signals causing tens of gigabits a second. Most significantly it will boost the facility of the many wavelengths at the same time.

Anand et al [11] delineated the performance of the sub-path protection scheme in terms of capacity utilization and recovery time, compared with path and link protection schemes.

Ho et al [12] planned that the network's primary path is split into many overlapped segments and therefore the backup path for every sub-domain is often calculated singly. Redundant trees are wont to give fast recovery and are conferred

Zang et al [13] developed an on-line network management mechanism to manage the connections in WDM mesh networks mistreatment path protection schemes. They use the two-step approach to route the connections. A replacement multiplexing technique referred to as primary backup multiplexing is planned

Urban et al [14] bestowed a hybrid rounded wavelength division multiplexing time-division multiplexing passive

optical network that's capable of providing information measure on-demand at high bit rates during a clear and dynamic manner.

Ramesh G. et al. [15] Communication networks have emerged as a supply of direction in today's society. At the worldwide level, the net is changing into the backbone of the fashionable economy. The new generations in developed countries cannot even create mentally a world while not broadband access to the net. The lack of this net infrastructure to deal with the large choice and ever-growing range of users, rising networked applications, usage patterns, and business models is more and more being recognized worldwide. The dynamic growth of network traffic and its burst nature needs a high transmission rate. With the advances and therefore the progress in Wavelength Division Multiplexing (WDM) technology, the number of raw information measures offered in fiber links have enhanced to high magnitude. This paper presents a survey on WDM networks from its development to this standing. Additionally, AN analysis of buffer size in optical networks for real-time traffic was performed.

C. Ou et al. [16], a sub-path protection for multi-domain networks is planned. It's a specific case of shared path protection. During this answer, when computing the first light-path within the topology of the multi-domain network, every domain protects the phase of the first light-path that crosses it. To facilitate the protection, the authors assume that the domains are connected directly along at border nodes. In different words, inter-domain links don't exist. The backup resources are shared only among backup segments within the same domain. Sub-path protection will even use completely different protection schemes in numerous domains (like Dedicated Protection Schemes) to supply protection supported differentiated quality of service (QoS). This answer offers acceptable recovery time, but the authors build the sturdy assumption that domains are connected directly along at border nodes. This assumption isn't realistic within the context of multi-domain networks.

III.Simulation Environment Setup Tool

The performance analysis of MAT-LAB 2013a that is used for this thesis The data mining application provides libraries optimized by the processor for fast execution and calculation, as well as execution cancer data. It uses its JIT (Just in Time) compilation technology to provide execution speeds that rival traditional programming languages. MAT-LAB also provides multi-threaded numeric functions for linear algebra and multiprocessor processors. These functions are automatically run on multiple computer threads in a single MAT-LAB and run faster on multicore computers. In this thesis, all improved and efficient data recovery results were achieved in MAT-LAB 2013a. MAT-LAB is the high-level language and interactive environment used by millions of engineers and scientists around the world. It allows exploring and visualizing ideas and collaborating across different disciplines and processes, signals and images, communication and calculation of results. MAT-LAB provides tools to search, analyze and visualize knowledge, modify your knowledge to better understand your knowledge when dividing the time it would take on victim spreadsheets or old languages. Programming. It can document and share the results of plots and reports or according to the revealed MAT-LAB code. MAT-LAB (Matrix Lab) could be a multi-state computing paradigm of fourth-generation digital and artificial languages. It is developed by mathematical work; MATLAB enables matrix strategies, fact and knowledge tracing, application of formulas, building user interfaces and programs. MATLAB stands mainly for mathematical computing; an optional toolbox using the MuPAD symbolic engine provides access to symbolic computing capabilities. It is similar to the Mat 2013a research lab and for this work; we used Intel 1.4 GHz machines with Windows 7, Windows XP, etc. MAT-LAB 2013a could be a high-level technical language and an interactive environment for the development of formulas, knowledge of cognitive images, file analysis, and mathematical research laboratory computing can be a computer code program to manipulate and visualize data, calculate, calculate and program. It can be used to perform very simple or very sophisticated tasks. Database, analysis, visualization, and development of algorithms. You can perform efficient data recovery upgrades. Many features in the toolbox are multithreaded to take advantage of multicore and multiprocessor computers. An additional package, Simulink, a neural network, and simulation configuration tools use Wi-max network analysis.

III.RESULT ANALYSIS

To analysis in the field of the WDM-OPN system and determine numerous challenges. The WDM technologies to form it more secure, strong and provide the customer with more reliable service. Our objective may be a higher SNR and less BER.

1. **Performance Analysis based on Normal Data size:** Experimentation on analyzer Results Based on Data Size 1TB (1000) compare between DS-SSMF, US-SSMF and proposed encoder with 4QAM. In the process, it's a simulation DS-SSMF and US-SSMF value BER more and proposed encoder to get value BER less and also signal power received more.
2. **Performance Analysis based on Data Size increases**: Experimentation on analyzer Results Based on Data Size 10TB (100000) compare between DS-SSMF, US-SSMF and proposed encoder with 4QAM. In the process, it's a simulation DS-SSMF and US-SSMF value BER more and proposed encoder to get value BER less and also signal power received more.

(a) System Simulation parameters

Table1. System Simulation parameters

Simulator Used	MATLAB TOOL
Digital modulation	4QAM
Channel	AWGN
Interleave size	[N* M]., where N=8,M=16
Dimension of simulated area	WiMax PHY layer
Packet size	128 bits (Frame length).
Code rate	X/Y. ,where X=172,,Y=134;
Transmission Network	Wi-Max Network
Data Transmission Encoder in Network	Encoder/Decoder based on WDM

Table2. set input values of parameters

Input Variable	Input Values	Explanation
Data size	1 to10TB	Size of the input data samples
Length _fft	2,4,8,16	Size of the FFT
Sub_car	52	Number of OFDM data sub-carriers
SNR	0 to 20	Range of SNR
No. of Iterations	30	Number of repetition count
Frequency Division (Fd)	100 Hz	Maximum Shift
Channel (c)	Channel	AWGN channel
Code Rate (Cr)	172/134	Code rate

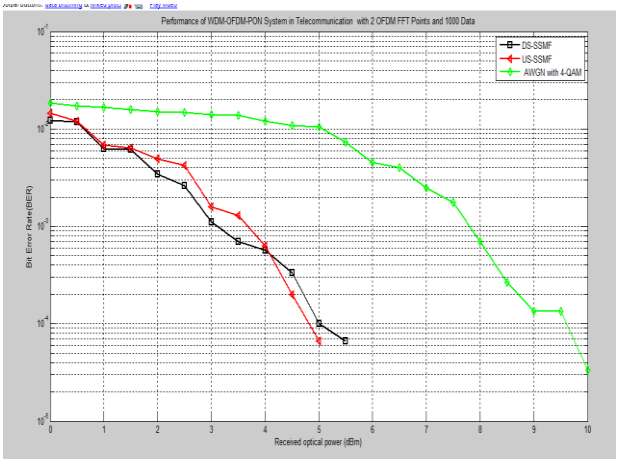

Fig.2 Comparison performances between PE and DSSSMF and USSSMF with FFT size of 2 and data length of 1TB Bit data

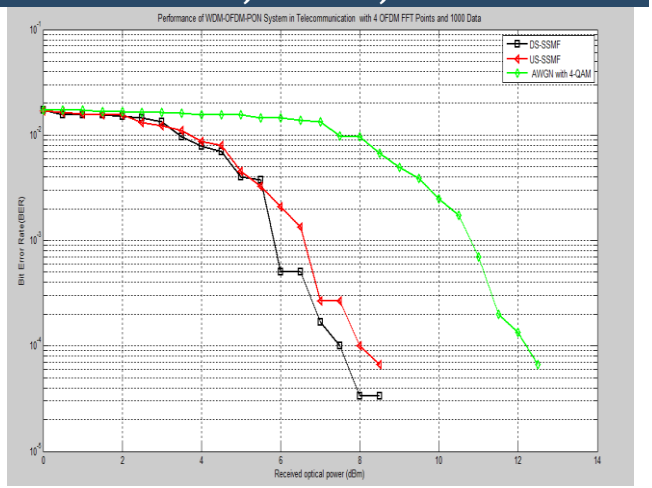

Fig3 Comparison performances between PE and DSSSMF and USSSMF with FFT size of 4 and data length of 1TB Bit data

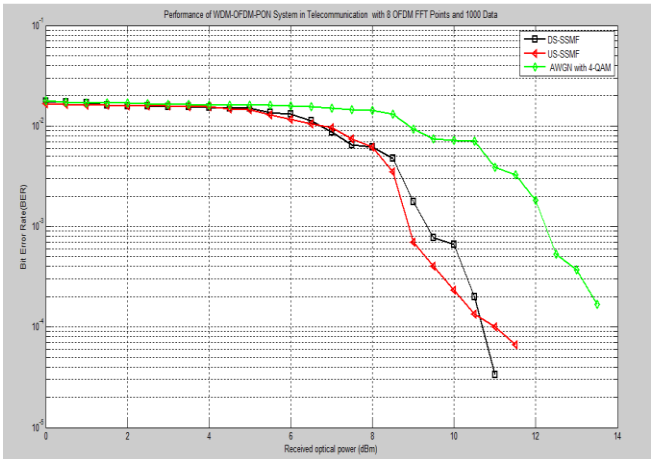

Fig4 Comparison performances between PE and DSSSMF and USSSMF with FFT size of 8 and data length of 1TB Bit data

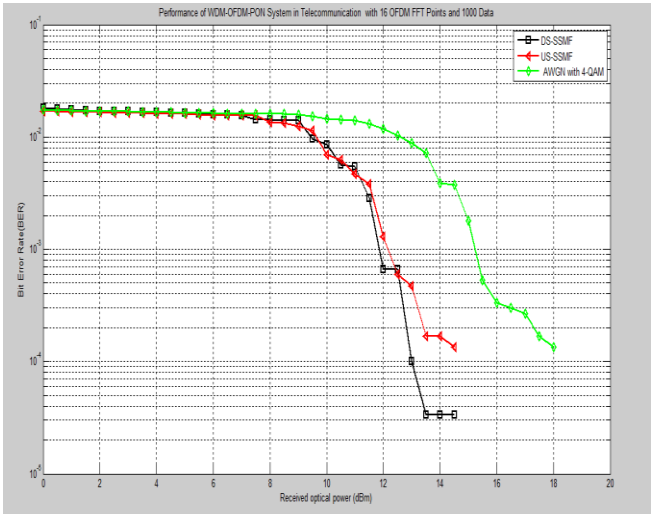

Fig.5 Comparison performances between PE and DSSSMF and USSSMF with FFT size of 16 and data length of 1TB Bit data

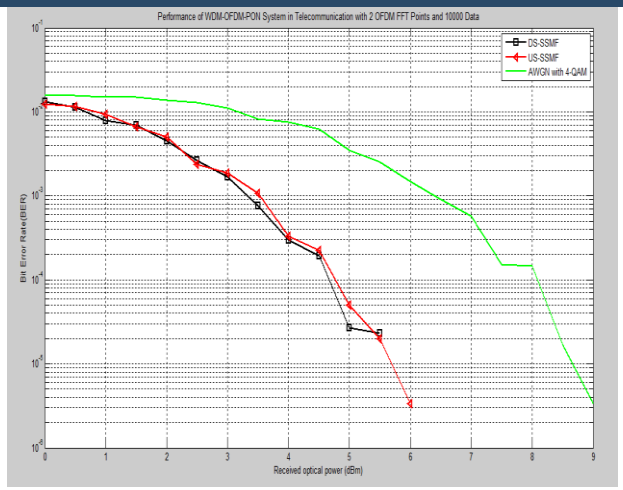

Fig.6 Increased Data Size Comparison of Performance between PE and DSSSMF and USSSMF with FFT size of 2 and data length of 10TB Bit data

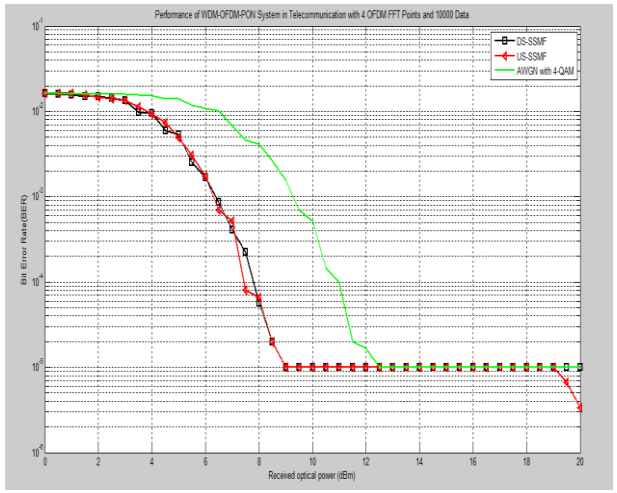

Fig.7 Increased Data Size Comparison of Performance between PE and DSSSMF and USSSMF with FFT size of 4 and data length of 10TB Bit data

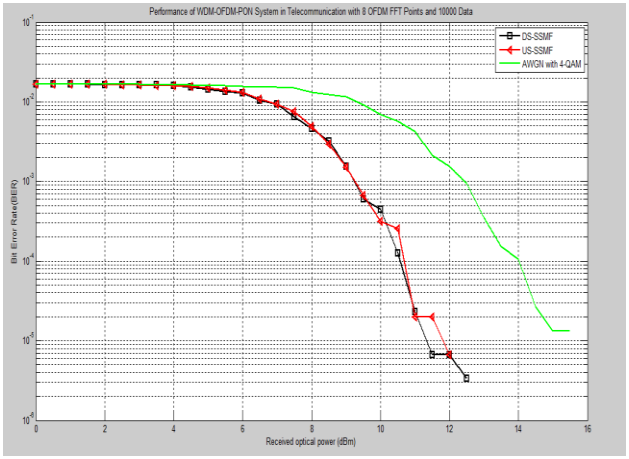

Fig.8 Increased Data Size Comparison of Performance between PE and DSSSMF and USSSMF with FFT size of 8 and data length of 10TB Bit data

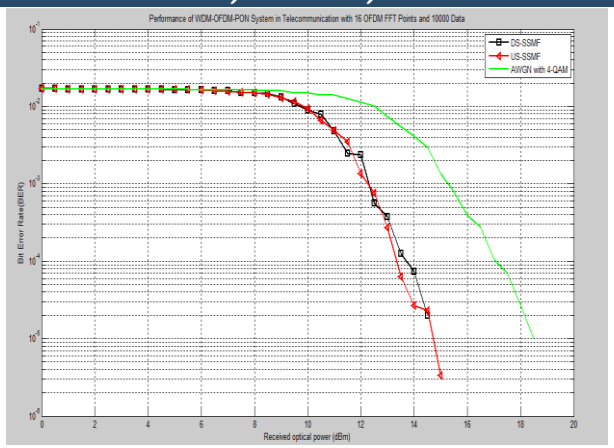

Fig.9 Increased Data Size Comparison of Performance between PE and DSSSMF and USSSMF with FFT size of 16 and data length of 10TB Bit data

IV. CONCLUSION

Enhanced WDM-OFDM-PON system based on higher data transmitted with 4QAM got self-addressed survivability in multi-domain optical networks. The most objective of this study is to survey and analyze the assorted existing solutions planned for survivability in multi-domain optical networks. Among the solutions given. This paper mentioned the problems and trends regarding low rate transfer however our planned technique information transfer rate high-capacity in optical networks. So as to beat the quantifiability limitations of core network nodes because of high complexness and enormous information transfer of current approaches, it's a very important challenge to find a well-suited and possible network idea that may be ready to give each high performance and low BER. Planned so far to be used within the optical network units of access networks, has been comprehensively investigated and compared in terms of their complexness and accomplishable sensitivities. Incontestable and economical WDM-OFDM-PON, within which all the worry are source-free for the upstream channels, enabled by a tunable multi-wavelength optical comb. WDM-OFDM-PON systems, the frequency interval of comb lines will be consequently tuned with real desires, effectively reduce the value and change the controlling method. Results based on higher data compare between DS-SSMF, US-SSMF and proposed encoder with 4QAM. proposed encoder to get value BER less and also signal power received more. WDM-OFDM-PON system more reliable and signal power received is good.

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