International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Email:editorijoer@gmail.com http://www.ijoer.in

Vol.4., Issue.3., 2016
(May-June)

RESEARCH ARTICLE

ISSN: 2321-7758

SIMULATION AND PERFORMANCE ANALYSIS OF DWDM THROUGH OPTISYSTEM

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ABSTRACT

Optical Fibre Communication has found vast applications in today's era. Optical fibre communication technology has made great progress, where has been constantly exploring new technologies. In this paper performance, analysis and simulation of Dense Wavelength Division Multiplexing has been explained with the help of OPTIWAVE simulation software OPTISYSTEM'13.0.This paper focuses on the 32 channel DWDM with described looping particularly explained by the BER analyser and the Optical Analyser[1].

Keywords: BER, DWDM, DCF, EDFA.

I. INTRODUCTION

OPTISYSTEM'13.0(OPTIWAVE Inc.) is an innovative optical communication system simulation package for the design, testing and optimization of virtually any type of optical link.OPTISYSTEM'13.0 represents an optical communication system as an interconnected set of blocks. Each block is simulated independently using the parameters specified by the user for that block and the signal information passed into it from other blocks. As physical signal are passed between components in a real-world communication system, "signal" data is passed between components models in the simulation. These blocks are graphically represented as icons in OPTISYSTEM'13.0 [2]

In Fibre Optic Communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fibre by using different wavelengths (i.e.colours) of laser light. This technique enables bidirectional communications over one strand of fibre, as well as multiplication of capacity.[3]

Dense wavelength division multiplexing (DWDM) refers originally to optical signals multiplexed within the 1550 nm band so as to leverage the capabilities (and cost) of erbium doped fibre amplifiers (EDFAs), which are effective for wavelengths between approximately 1525–1565 nm, or 1570–1610 nm.[4]

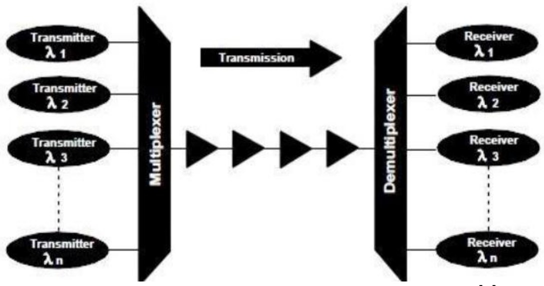

Fig.1 Block Diagram of DWDM System[5]

In the DWDM System n- Transmitter are used for sending n-number of signal to nx1 multiplexer as shown in Fig.1,which combines the output of n- transmitter and launch it into optical fibre channel. Optical fibre sends signal to the input of 1xn de-multiplexer, which split the received n-channel signal into individual channel to different receivers.[6]

II Simulation Parameters

Parameters	Value
1. Reference frequency	1450 nm
2. Frequency Spacing	100 GHz
3. Optical Fibre Length	70 km
4. DCF Length	12 km
5. Optical Amplifier Gain	10 dB
6. Optical Receiver Cutoff Frequency	0.75x Bit rate Hz

New BER Test Set enables the simulation of millions of bits for direct error counting. Multi-parameter scanning enables system designers to study trade-offs with respect to parameters of interest and to choose an optimal design for deployments. Itenables users to analyse different algorithms for the electronic equalisation[8] and Interfaces with popular design tools. Significantly, it also reduces product development costs and boosts productivity through a comprehensive design environment to help plan, test, and simulate optical links in the transmission layer of modern optical networks[9].

III Simulation / Calculation

In the given layout, we have simulated a 32-channel DWDM network with both RZ and NRZ modulation formats at 40 GB/s[10]. The transmitter section consists of a 32-channel WDM transmitter with starting Frequency of 1450nm and the frequency spacing is 100 GHz. We have used a transmission loop as an optical link with a length of 70 km of SMF, 12 km of DCF and two EDFA's[11]. The receiver is a 32-channel WDMde-multiplexer, with PIN photo detectors and BER testers.

The schematic Layout for DWDM simulation is shown in Fig. 2 using OPTISYSTEM'13.0 .The 32-channel multiplexer has been used along with DCF with the general Optical fibre.

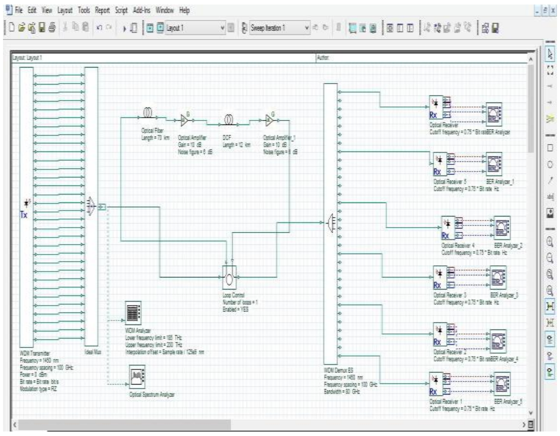

Fig.2 Schematic layout of DWDM

IV RESULTS

The output of WDM analyser is shown in Fig.3 and Fig. 4:

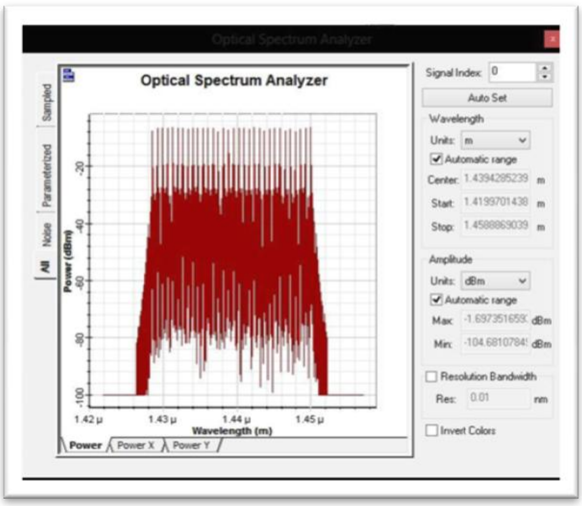

Fig.3

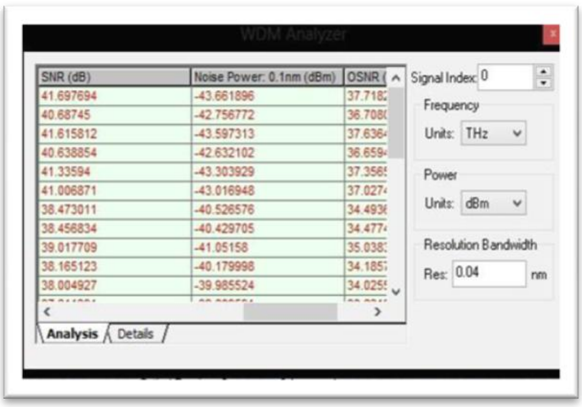

Fig.4

The Eye diagram and Output of BER analyseris shown in Fig.5 and Fig.6:

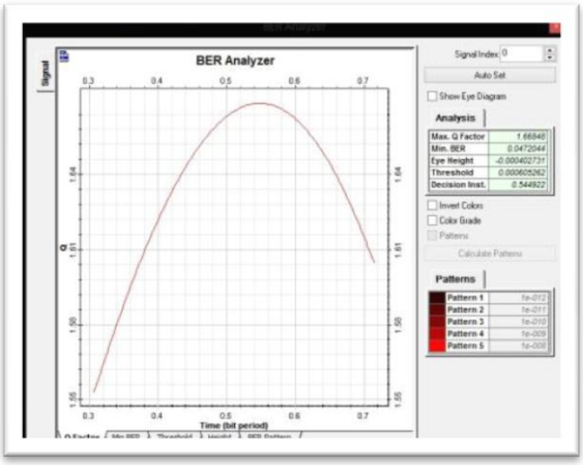

Fig.5

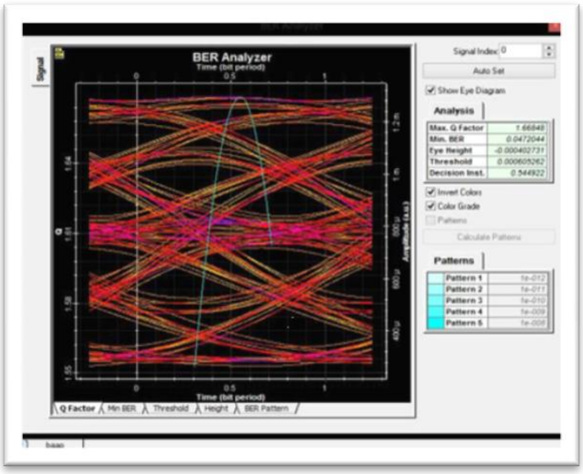

Fig.6

The eye diagram and output of BER analyzer_1 is shown in Fig. 7 and Fig.8:

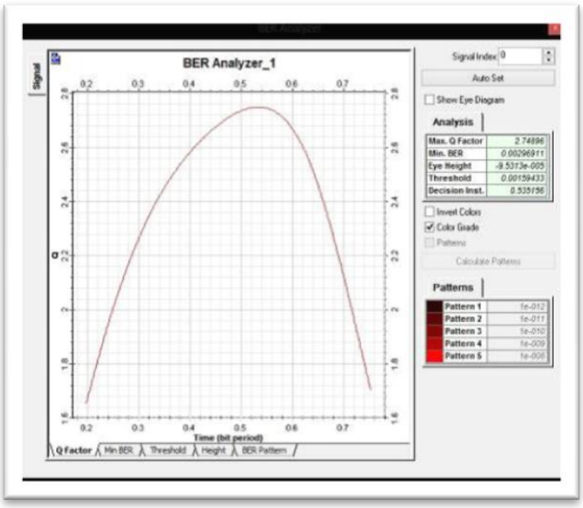

Fig.7

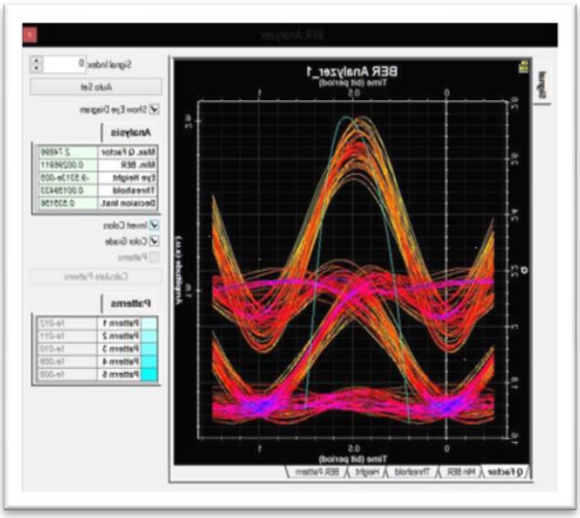

Fig.8

The eye diagram and output of BER analyzer_2 is shown in Fig.9 and Fig.10:

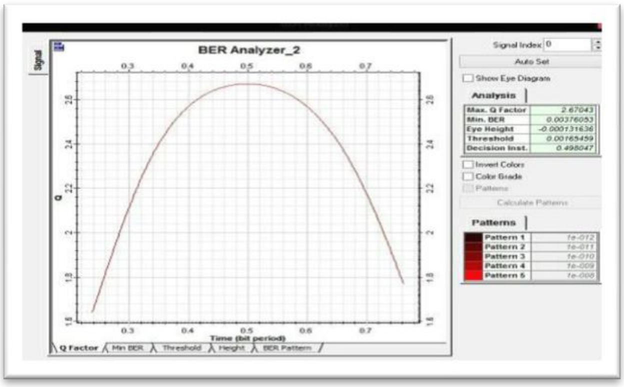

Fig.9

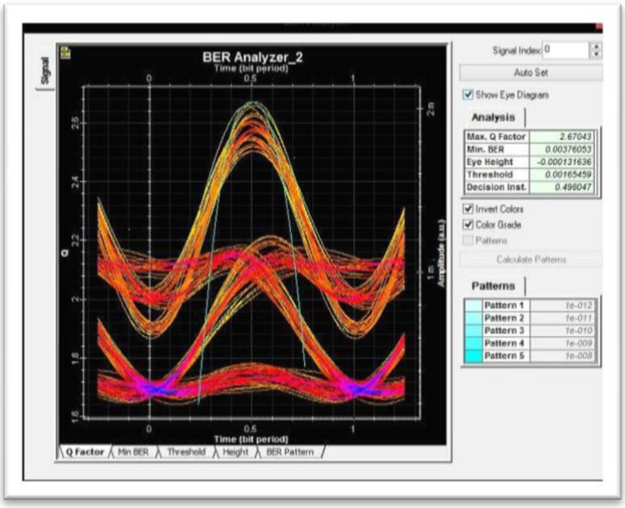

Fig.10

The eye diagram and output of BER analyzer_3 is shown in Fig.11 and Fig.12:

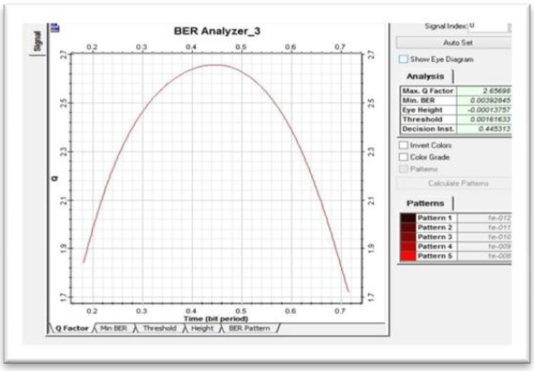

Fig.11

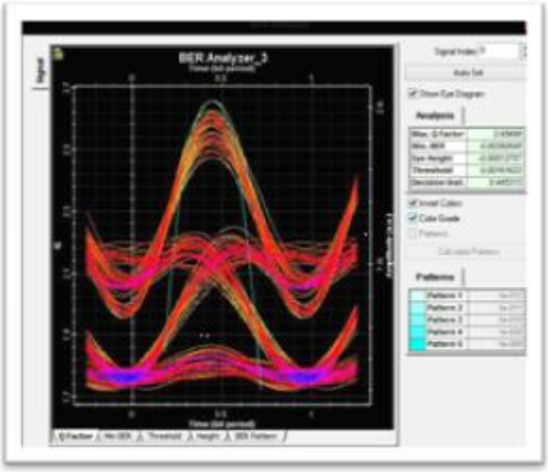

Fig.12

The eye diagram and output of BER analyzer_4 is shown in Fig.13 and Fig.14:

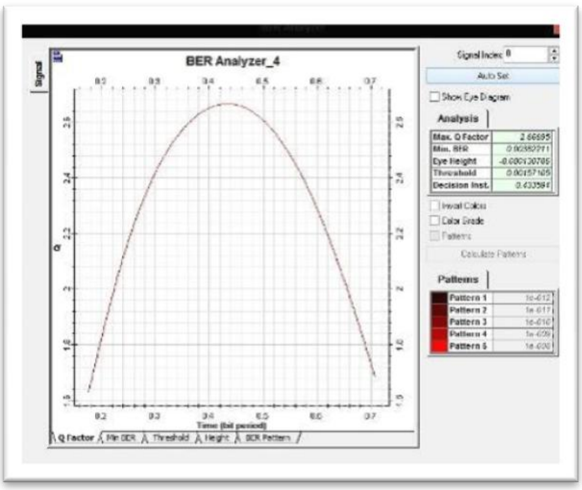

Fig.13

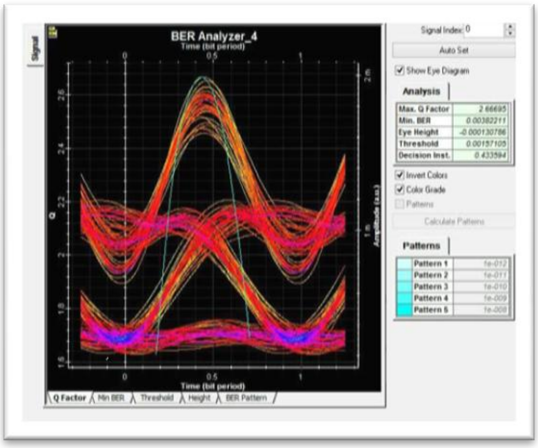

Fig.14

The eye diagram and output of BER analyzer_5 is shown in Fig.15 and Fig.16:

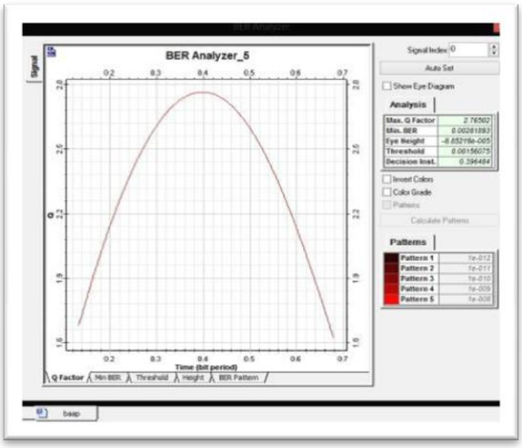

Fig.15

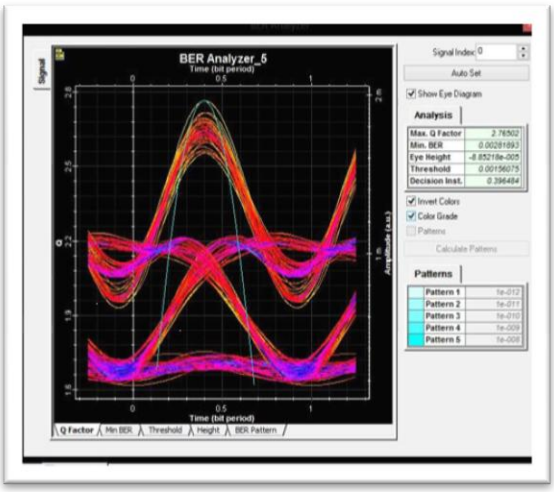

Fig.16

V Conclusion

This paper unfolded various aspects in the simulation of Dense Wavelength Division

Multiplexing. OPTISYSTEM isapt Software for understanding and designing the optical link circuits. The 32 channels DWDM simulation presented here is explained with Eye diagrams and BER analysers[12].

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