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Optical wired DWDM Based OFDM Design and simulation

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ABSTRACT
In this paper we designed optical wired DWDM based OFDM design and simulation .The system whole setup is achieved by DWDM-OFDM for prefect SSMF optical wired communication (OFC) for 60 KM, using Due to increasing data traffic in network its required to design high effective spectral transmission. Here we implemented design with OFDM-DWDM due to own high spectral efficient property of 60 Gbps using 4- QAM.

Introduction

Orthogonal frequency division multiplexing (OFDM) is a multicarrier transmission technique where a data stream is carried with many lower-rate subcarrier tones [1], [5]. In optical communication systems OFDM has received increased attention as a means to overcome various limitations of Optical transmission systems such as modal dispersion, relative intensity noise, Chromatic dispersion, Polarization mode dispersion and self phase modulation. Coherent Optical OFDM (CO-OFDM) combines the advantages of coherent detection and OFDM Modulation and possesses many merits that are critical for future high –speed fiber transmission systems.

DWDM improvement is a challenging technique in present time to meet this requirement. In DWDM system frequency spacing between adjacent channels should be less or equal to 200GHz. This technique is used to make full use of huge bandwidth resources o flow-loss standard single mode fiber (SSMF). Here the optical signals of different frequencies are highly coupled and transmitted through a single fiber. High spectral efficiency in DWDM system can be achieved with an attractive bit rate of 10Gbps [3]. 100GHzand 50GHz frequency spacing in DWDM[2] systems are used for Implementing metro and local area network systems, due to cost advantages but the dispersion and nonlinearity must be managed to achieve transmission over an appreciable distance. Dispersion management, utilizing specialized fiber of opposite direction values, is a key technique that keeps the total accumulated dispersion low while suppressing the nonlinear effects. In dispersion-managed systems utilizing standard single mode fiber (SSMF) and dispersion compensating fiber (DCF), the positive dispersion of SSMF can be compensated by large negative dispersion of DCF. Hence overall dispersion accumulation is minimized over a fairly wide wavelength range and four-wave mixing (FWM) is significantly reduced.

Analysis and investigations have shown OFDM with DWDM turns out to be superior one for High data communication systems. However, the main concern in a long-haul system is the reach ability. Thus, it is highly essential to design an optimal system. In Our present work we have proposed a 4-channel 60-Gbps system with channel spacing of 50GHz using 4-QAM [1].

Theory

A generic CO-OFDM DWDM SYSTEM includes four basic functional blocks: OFDM Transmitter, 4 MUX, 4 DEMUX, OFDM receiver

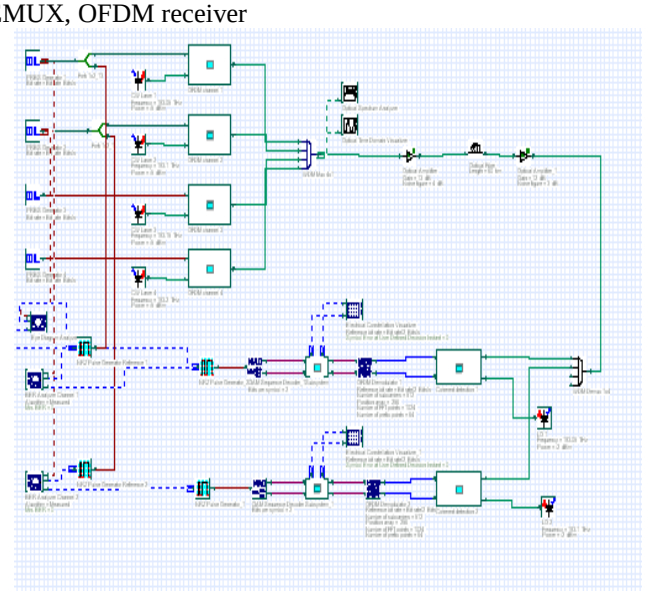

Fig 1 Optical OFDM DWDM Layout

The above schematic demonstrates a 4 Channel, 60 Gbps coherent coherent 2048 subcarriers 4 QAM OFDM systems however the input data for the OFDM modulator can have different modulation formats such as BPSK, QPSK, QAM, etc. At the transmission block, both modulation and multiplexing are achieved digitally using an inverse fast Fourier transform. The subcarrier frequencies are mathematically over the orthogonal over one OFDM symbol period. A CW laser and machzehnder

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modulators are used to convert electrical domain to Optical domain .The DWDM multiplexing used to multiplex four channels in the frequency range of 193.0 THz to 193.2 THz with channel spacing of 50 GHz the signal is then propagated through the optical link and becomes degraded due to fiber impairments. A coherent receiver with a local oscillator is used to convert data into RF domain and finally data is demodulated and sent to the detector and decoder for BER measurements.

Simulation & Discussion

The setup is designed to simulate for the OFDM-DWWM system design for a distance of 60 Km. Figure 1 shows the Optical OFDM DWDM layout design by using Opti system 11.

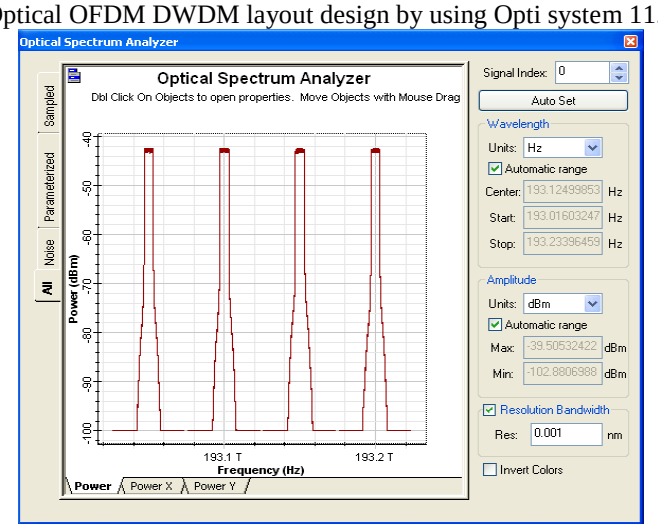

Figure.2 Optical spectrum analyzer

Figure 2 shows the optical spectrum for four channels with the Frequency range of 193.0-193.2THz.

Figure3&4 shows the Electrical constellation for OFDM-DWDM receiver with QAM modulation technique for a distance of 60 Km

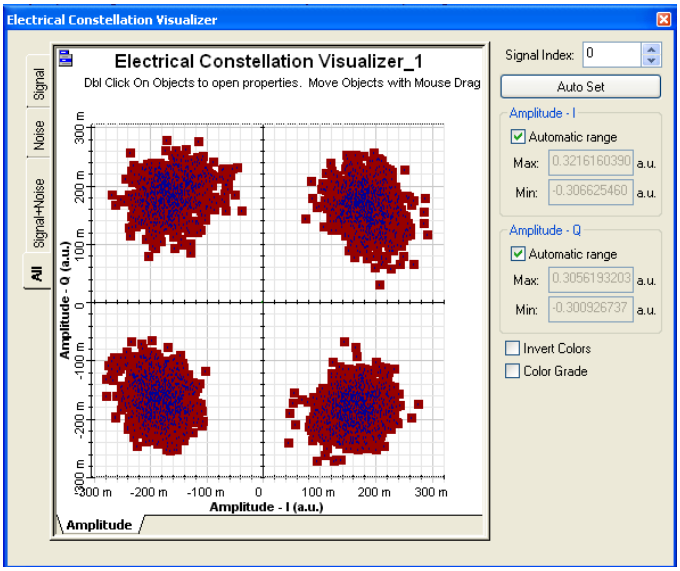

Fig 3 Electrical constellation for Receiver 1

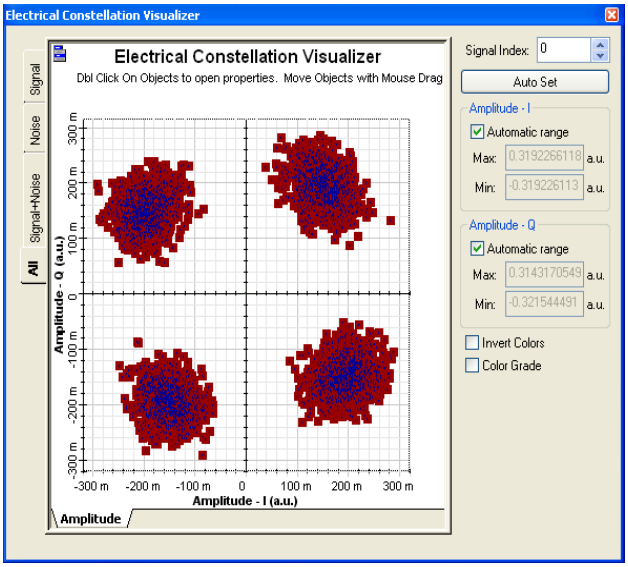

Figure.5.RF Receiver circuit diagram.

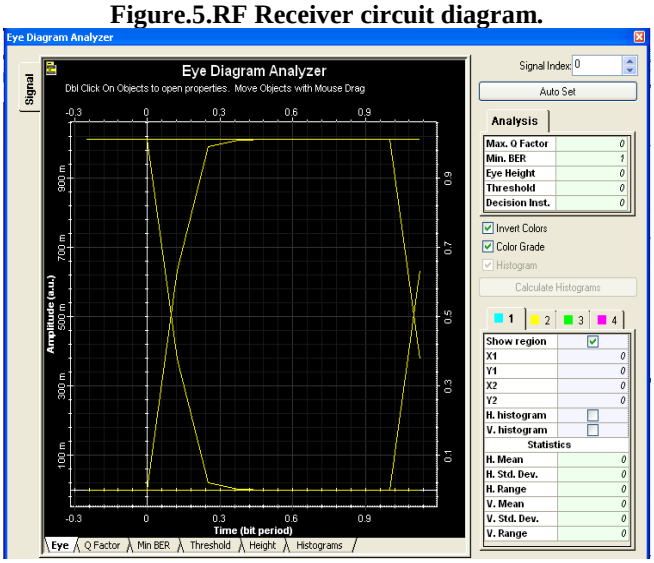

Fig.6 Eye diagram of channel No.1 of the Setup at a distance of 100Km

Table 1 Simulation Parameters

Bit rate	60 Gbps
DWDM channel spacing	50 GHz
Capacity	4 Channels 60Gbps
Distance	100
Input Power	4dbM
Sequence Length	8192 bits

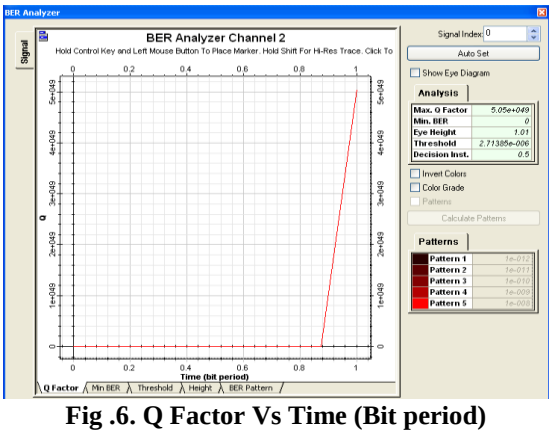

Fig .6. Q Factor Vs Time (Bit period)

Conclusion

We have simulated a 4-channel 60Gbps OFDM-DWDM system using 4-QAM modulations Technique for channel spacing of 50GHz.For this setup we have analyzed the High data rate network performance for Optical OFDM-DWDM scheme. The Q factor vs. time (Bit Period) obtained is 5.05*10+49 for all the channels at a distance of 60 km 7. Hence the proposed OFDM DWDM system is suitable for a long range point-to-point communication for a coverage distance up to 100Km. The above system may further be analyzed and optimized for various modulation techniques.

References

[1] Shikha Nema, Aditya Goel, R P Singh. 2009. Integrated DWDM and MIMO-OFDM System for 4G High Capacity Mobile Communication. *Signal Processing*, Volume 3 Issue, page 132-43.

[2] Anu Sheetal, Ajay K.Sharma, R.S. Kaler. 2010.Simulation of high capacity 40Gb/s long haul DWDM system using different modulation formats and dispersion compensation schemes in the presence of Kerr's effect", *Optik* 121,739-749.

[3] Bijayananda Patnaik Prasant Kumar Sahu Long-Haul 64-Channel 10-Gbps DWDM System Design and Simulation in Presence of OpticalKerr's Effect.

[4] Bijayananda Patnaik Prasant Kumar Sahu,Ultra high capacity 1.28Tbps DWDM system design a simulation design using Optimized modulation format.

[5] G.P.Agrawal. Nonlinear Fiber Optics, Academic Press, New York.2001.