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New Design of DWDM based on DCF Technique

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ABSTRACT
In this work, physical layer impairments and their impacts on transparent optical networks is studied. Among the impairments we mainly focused on in band crosstalk and try to incorporate its effect in the DWDM process. BER due to component crosstalk in a WDM receiver has been studied and computed results are shown by simulation as a function of number of interfering channel. A new design is developed for efficient data path provisioning with guaranteed QoT in terms of BER. This design is particularly very useful for high speed WDM/DWDM networks where, these impairments are high. The result shows that our crosstalk aware design reduces network blocking probability, utilizes network resources and give better quality of transmission as comparison to impairment unaware design.

Keywords
DWDM, OEO, RWA, Dispersion Compensation, Linear loss

1. INTRODUCTION
Optics is clearly the preferred means of transmission, and WDM transmission is now widely used in the networks. In recent years people have realized that optical networks are capable of providing more function than just point-to-point communication. Bandwidth that an optical network support is in the terabit range, and for this high data rate, it became more difficult for the electronics to process the data. In first generation networks the electronics at a node not only handle the data intended for that node but also all the data that has to be passed through that node for some other node. Hence burden on the underlying electronics increases. That means we need faster electronic switching circuit, which can operate in the terabit range. But electronic circuits have some limitation and till date their maximum speed is in the Gigabit range. In order to utilize the enormous bandwidth of optical fiber and to reduce the optoelectronic miss-match we move towards WDM networks. Among the WDM networks, opaque network are used in early stages and they consume more power. Another problem with these networks is that they are not scalable to satisfy future demands. To overcome these drawbacks people go for all optical/transparent networks, which are more scalable, consumes less power and has higher data carrying capacity.

2. RESULT AND ANALYSIS

2.1 Introduction
As elaborated in the previous chapter that system consists of mainly three distinct parts firstly transmitter part secondly transmission link part and last but not the least receiver part. Our result is fully concerned with these parts. It is also noted that in this theoretical concept we have ignored various practical aspect like transmitter and receiver sub-career and so on. Only those parameters are taken into concern which directly affects the optical data transmission. Some assumptions are also made in the process. Analysis is completely based on the various plotting between the various parameters.

2.2 Results for Transmitted Signals from Control Station Wavelength Spectrum of Multiplexed Data at CS
The spectrum of the multiplexed signal for these 32 signals for downlink is shown in Figure 1 Which shows the wavelength (in nm) versus power (in dBm) graph? Figure concludes that we are getting the peak powers at wavelength ranging from 1528 nm to1577.86 nm. Wavelength 1528nm and 1577.86 nm represents the data signals. The CS is able to transmit the signal from conventional band to larger band i.e. L band in this new design.

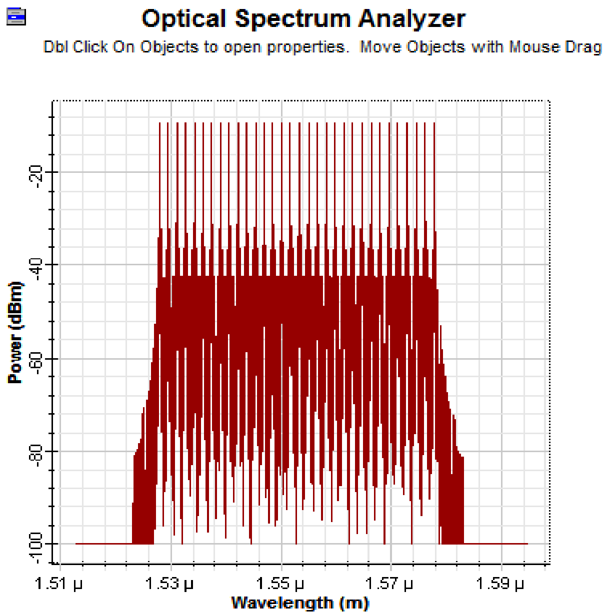

Fig 1: Wavelength Spectrum of Multiplexed Data at CS

2.3 Results for Received Signals from Control Station Spectrum of Multiplexed Signals Received at CS
The undersigned Figure 2 represents the spectrum plot for the multiplexed signals at the BS. It's clear that some noise are present with the data signals but we are getting equal peak power at wavelengths at which we have modulated our signals i.e. from 1528 to1577.86 nm. Along with these frequency ranges we are also getting a extra range of the frequency wings being demonstrated with the green circle which is the result of the four wave mixing.

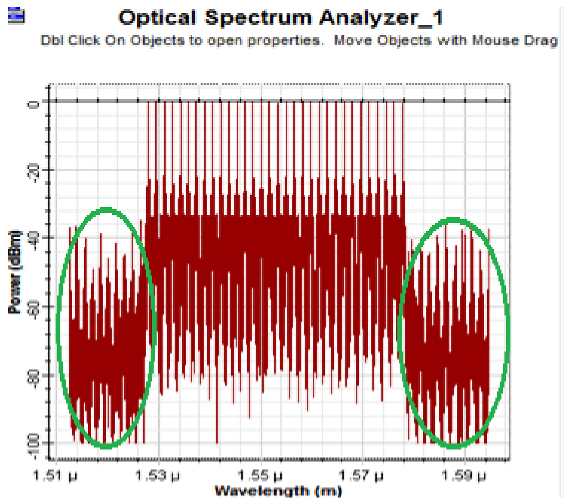

Fig 2: Spectrums of Multiplexed Signals Received at CS

When the signal passes through the optical fiber the noise gets merge into the signal to the uttermost level. The Figure 3 shows the multiplexed signal received after the signal passage through the optical fiber. The green rectangular shape shows the noise level. The level of the noise is ranging from the -55 to that of -100 dBm. These noses are easily separated from the signals at the receiver ends with the help of the low pass filter.

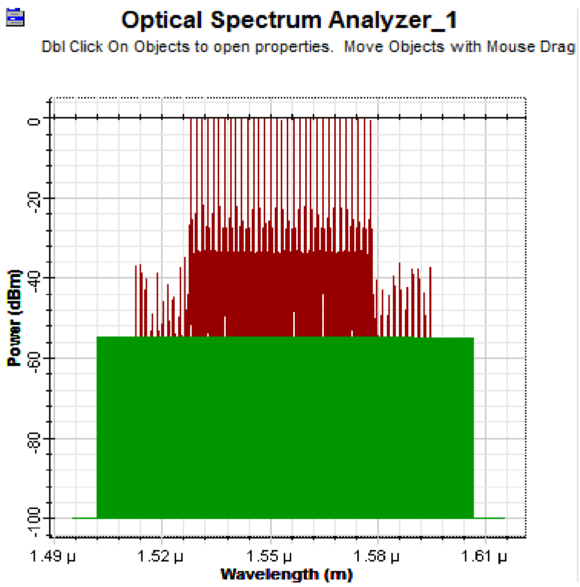

Fig 3: Spectrum of Multiplexed Signals Received after fiber

2.4 Analytical Study based on Gain to the Wave-Length of the Setup Model

Gain and the wave length are the two important parameters in the design and the analysis of any setup model. Here the analytical study between the gain and the wavelength is plotted in the graphical foam. The Fig 4 shows the variation in the gain of the model with respect to the change in the wavelength of the system. The variation in the gain is due to the four waves mixing, cross phase modulation and self phase modulation. In the above figure it's clear that the maximum variation is on 1545 nm wavelength and minimum variation is on 1565 nm wavelength. The green circle in the diagram shows the mentioned variation.

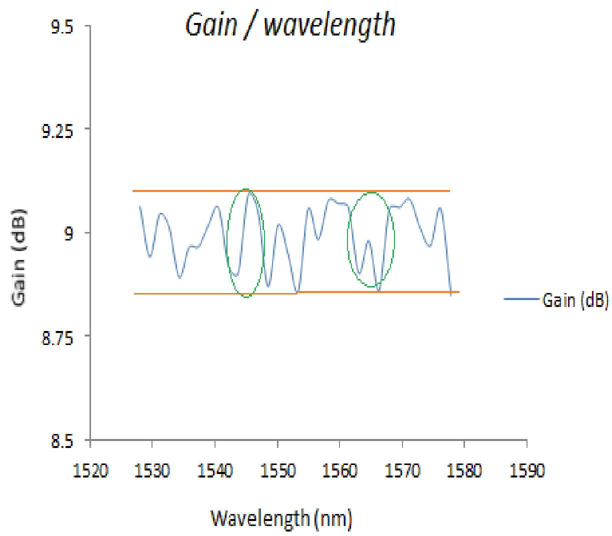

Fig 4: Gain v/s Wave Length Plotting

2.5 Analytical Study based on Gain to the Noise figure of the Setup Model

The Noise Figure and the gain analysis plotting of the setup model are shown in the setup model. In the figure it is clear that the as the gain is increasing the noise figure is decreasing. The maximum value of the noise figure is in between 8.8 dB to 8.9 dB, where as the minimum value of the noise figure is when the gain is 9.1 dB. So the Figure 5 concludes that the noise figure is inversely proportional to that of the gain.

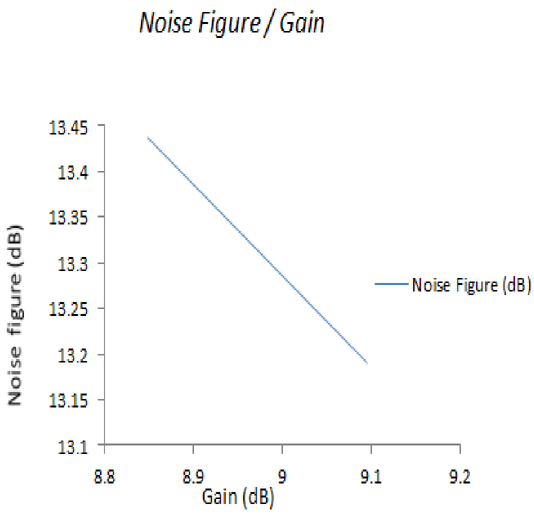

Fig 5: Noise figure v/s Gain plotting

2.6 Analytical Study based on Output Noise to the Wavelength of the Setup Model

The output noise is the vital parameter in the any type of the analysis. In Figure 6 the graphical analysis is done between the output noise and between the wavelengths. As the wavelength approaches to the maximum limit the value of the output noise decreases. This nature also shows that both of them are inversely related with each other.

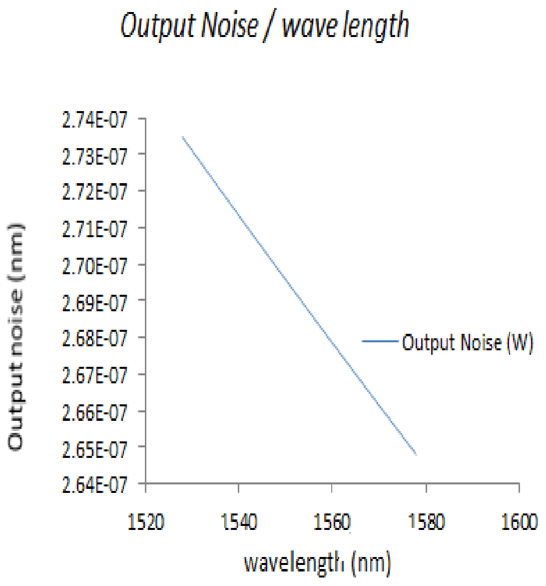

Fig 6: Output Noise v/s Wave-Length Plotting

3. CONCLUSION

As traditional scheme pays a little regard to the physical layer impairments and cannot provide optimized network performance in practical networks, we have proposed a novel BER constrained, FWM aware DWDM design. The performance of the proposed design is demonstrated through simulation and the results.

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