CROSSTALK ANALYSIS OF A FBG-OC BASED OPTICAL ADD-DROP MULTIPLEXER FOR WDM CROSSCONNECTS SYSTEM

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ABSTRACT

Theoretical analysis and numerical simulation is carried out to evaluate the performance of an Optical Add-drop multiplexer (OADM) for Wavelength Division Multiplexing (WDM) transmission system in the presence of linear crosstalk due to Fiber Bragg Gratings (FBGs) and optical circulator (OC) which can be used in Optical Crossconnects. We analyzed here the add drop multiplexing system for multiple wavelength channels, different condition of channel presence and channel separation. We simulate the crosstalk power, signal-to crosstalk ratio (SCR) and bit error rate (BER) of the system with different number of channels presence. Here we compared crosstalk power and SCR for multiple wavelength channels like 4, 8, 16, 32 channels considering different channel separation and drop of channels from the system. It is found that the SCR increases with the channel separation and SCR decreases with increase of the channel Bandwidth (B). BER increases with the number of wavelength channels due to increased in amount of crosstalk.

KEYWORDS: *BER, Crosstalk depends on channel presence, FBG, OADM, OC, SCR.*

I. INTRODUCTION

The Optical add–drop multiplexer (OADM) is a key component for wavelength-division multiplexing (WDM). An important technical issue for OADM design is the crosstalk, which can severely degrade system performance. Many types of OADMs have been demonstrated based on different optical devices. These devices include arrayed-waveguide grating multiplexers, Mach–Zehnder interferometers with fiber Bragg gratings (FBGs), and optical circulators with FBGs. Among them, the structures that use fiber gratings combined with circulators are attractive because of their low insertion loss, low crosstalk, and temperature and polarization insensitivity [1].

In this paper, we demonstrate and analysis the OADM structures that exhibit low crosstalk even with multiple wavelengths. The OADM use a simple configuration of a 3 port Optical Circulator with FBGs, depending on the requirement of ADD or DROP channel. It can be used in Optical Cross Connects to design Broad Optical Networks. WDM has already been introduced in commercial systems.

Crosstalk analyses of OXCs presented so far are generally focused on conventional OXCs [2 - 4]. All-optical cross connects (OXC), however, have not yet been used for the routing of the signals Broad Optical Networks. Several OXC topologies have been presented in previous paper, but their use has so far been limited to field trials, usually with a small number of input–output fiber and/or wavelength channels. The fact, that in practical systems many signals and wavelength channels could influence each other and cause significant crosstalk in the optical cross connects.

We have analyzed the basic principle and Bandwidth of FBG, general formula of system BER. We have evaluated the Crosstalk power, Signal to crosstalk ratio and the mathematical expression of BER of FBG-OC based WDM Crossconnects system with different number of channel presence, variable channel separation and number of input channels up to presence the effects on desire signal. The Results are discussed in the later section.

II. SYSTEM ANALYSIS

2.1 BASIC PRINCIPLE OF FIBER BRAGG GRATINGS

FBGs today constitutes an extremely important wavelength-selective all-fiber guided wave component for a myriad of applications such as filtering, wavelength multiplexing, demultiplexing and signal add/drop applications to combine or separate wavelength channels in DWDM optical communication systems. FBGs can be used as a wavelength selective feedback mirror to lock the lasing wavelength of a laser diode [1, 5].

A Bragg grating is a periodic perturbation of the refractive index along the waveguide formed by exposure to an intense ultraviolet optical interference pattern. For example, in an optical fiber, the exposure induces a permanent refractive index change in the core of the fiber. This resulting variation of the effective refractive index n_{eff} of the guided mode along an optical fiber axis, z, can be described by:

$$\partial n_{eff} = \Delta\bar{n}(z)\left\{1 + v\cos\left[\frac{2\pi}{\Lambda}z + \varphi\right]\right\} \qquad (1)$$

Where $\Delta\bar{n}(z)$ is the "dc" index change spatially averaged over a grating period, v is the "fringe visibility" of the index change, is the nominal grating period, and $2\pi/\Lambda$ describes grating chirp [6].

From the Couple mode theory, In Bragg gratings (also called reflection or short-period gratings) coupling occurs between modes travelling in opposite directions and so the mode travelling in the opposite direction should have a bounce angle, $\theta_2 = -\theta_1$. Since the mode propagation constant β is given by:

$$\beta = \frac{2\pi}{\lambda} n_{(eff)} \qquad (2)$$

Where, $n\_eff = n \sin\theta$ and $\lambda = (n_{eff,1} + n_{eff,2})\Lambda$

If the two modes are identical, the result is the well known equation for Bragg reflection:

$$\lambda_B = 2n_{eff} \qquad (3)$$

Therefore, the peak of the Bragg reflection is:

$$\lambda_{max} = \lambda_B\left(1 + \frac{\overline{\Delta n}\,\eta}{n}\right) \qquad (4)$$

Finally, the power reflection is [7]:

$$R = \frac{|k_{ac}|^2 \sinh(\gamma L)}{\delta^2 \sinh^2(\gamma L) + \gamma^2 \cosh^2(\gamma L)} \qquad (5)$$

And transmission power:

$$T = \frac{\gamma^2}{\delta^2 \sinh^2(\gamma L) + \gamma^2 \cosh^2(\gamma L)} \qquad (6)$$

At the phase matching wavelength, or the Bragg grating centre wavelength, there is no wave vector detuning and δ equals zero, the expression for the reflectivity and transitivity become:

$R = \tanh^2(\gamma L)$ and $T = \frac{1}{\cosh^2(\gamma L)}$ for uniform gratings.

The Bandwidth of an UFBG (Uniform FBG) is [7]:

$$\mathrm{BW} = \frac{\lambda_B{}^2\sqrt{\pi^2 + (k_{ac}L)^2}}{\pi\, n_{eff}L} \qquad (7)$$

For strong gratings, $(k_{ac}L)^2 >> \pi^2$, the bandwidth is independent of the length of the grating and is proportional to the "ac" coupling constant.

$$BW = \frac{\lambda_B{}^2 k_{ac}}{n_{eff}\pi} \qquad (8)$$

2.2 Implementation of Gaussian Pulse Or Sinc Pulse

Data transmission form is one of the crucial factors of the optical communication systems. The Gaussian pulse form is considered as it more accurately models the data waveforms generated in practical optical communications systems. The Gaussian Function is [8]:

$$\mathrm{G}(\omega) = \frac{1}{\sigma_\omega\sqrt{2\pi}}\exp\left(-\frac{\omega^2}{2\sigma_\omega{}^2}\right) \qquad (9)$$

Here we used sinc pulse as data transmission, which is given by:

$$sinc = {sin(\pi f T_b)}/{\pi f T_b} \qquad (10)$$

Where, f = sample frequency; $T_b = 1/R_b$

R_b= Bit Rate of the sample.

2.2.1 Analysis of Optical Bandwidth

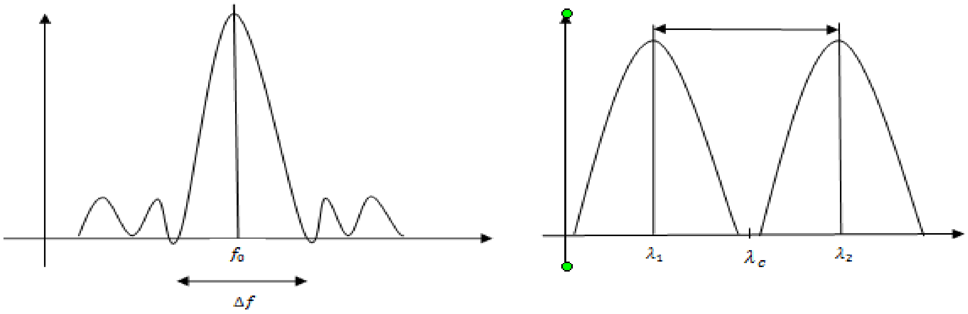


Figure 1: Optical Bandwidth and Channel Separation

$\because \lambda_0 \gg \Delta\lambda \therefore \Delta f = \frac{\Delta\lambda . c}{\lambda_0{}^2}$,

For, $\Delta\lambda = 0.1\mathrm{nm}$ (Channel Spacing)

$\Delta \mathrm{f} = 12.5$ GHz if $\lambda_0 = 1550\mathrm{nm}$.

Let us assume that a signal s has a Gaussian probability distribution function with a mean value m.so the probability density function is given by:

$$f(s)ds = \frac{1}{\sigma\sqrt{2\pi}}\exp\left(-\frac{(\mathrm{s}-\mathrm{m})^2}{2\sigma_\omega{}^2}\right)ds \qquad (11)$$

Now, The BER equation can then be written as [8] :

$$BER = \frac{1}{2}\left[P\left(\frac{0}{1}\right) + P\left(\frac{1}{0}\right)\right] \qquad (12)$$

Where, Probability p(1/0) is deciding '1' when '0' is transmitted and p(0/1) is deciding '0' when '1' is transmitted

$$P(0/1) = \frac{1}{\sigma_1\sqrt{2\pi}} \int_{-\infty}^{I_D} \exp\left(-\frac{(I + I_{CT1} - I_1)^2}{2\sigma_1{}^2}\right) dI$$

$$\gg P(0/1) = \frac{1}{2} erfc\left(\frac{I_1 + I_{CT1} - I_D}{\sigma_1\sqrt{2}}\right) \quad (13)$$

$$P(1/0) = \frac{1}{\sigma_0\sqrt{2\pi}} \int_{I_D}^{\infty} \exp\left(-\frac{(I + I_{CT0} - I_0)^2}{2\sigma_0{}^2}\right) dI$$

$$\gg P(1/0) = \frac{1}{2} erfc \quad (14)$$

Where erfc stands for the complementary error function, defined as :

$$erfc(x) = \frac{2}{\sqrt{\pi}} \int_{x}^{\infty} \exp(-y^2)\, dy \quad (15)$$

So, the BER is given by:

$$BER = \frac{1}{4}\left[erfc\left(\frac{I_1 + I_{CT1} - I_D}{\sigma_1\sqrt{2}}\right) + erfc\left(\frac{I_D + I_{CT0} - I_0}{\sigma_0\sqrt{2}}\right)\right] \quad (16)$$

The BER depends on the decision threshold I_D. In practice, I_D is optimized to minimize the BER. The minimum occurs when I_D is chosen such that:

$$\frac{(I_D + I_{CT0} - I_0)^2}{2\sigma_0} = \frac{(I_1 + I_{CT1} - I_D)^2}{2\sigma_1} + \ln\left(\frac{\sigma_1}{\sigma_0}\right)$$

$$\gg \frac{I_D + I_{CT0} - I_0}{\sigma_0} = \frac{I_1 + I_{CT1} - I_D}{\sigma_1} \equiv Q$$

$$\gg I_D = \frac{\sigma_0(I_1 + I_{CT0}) + \sigma_1(I_0 + I_{CT1})}{\sigma_0 + \sigma_1} \quad (17)$$

The BER with the optimum setting of the decision threshold is obtained by :

$$BER = \frac{1}{2} erfc\left(\frac{Q}{\sqrt{2}}\right) \approx \frac{\exp(-Q^2/2)}{Q\sqrt{2\pi}} \quad (18)$$

Here I_{CT0}= Crosstalk Photocurrent when bit “1” is transmitted, and I_{CT1}= Crosstalk Photocurrent when bit “0” is transmitted.

III. NOISE CALCULATION

Now, Optical receivers convert incident optical power Pin into electric current through a photodiode. The relation [9] :

$$Ip = Rd\ Pin \quad (19)$$

Where Ip = Average current;

Pin = Incident power;

Rd= Responsivity of the photodetector (A/W)

The Responsivity R can be expressed in terms of a fundamental quantity η, called the quantum efficiency and defined as :

$$R = \frac{\eta q}{h\nu} \approx \frac{\eta\lambda}{1.24} \quad (20)$$

3.1 SHOT NOISE

Shot noise is a manifestation of the fact that an electric current consists of a stream of electrons that are generated at random times. The total shot noise in receiver is given [9] by:

$$\sigma^2 = 2qIp\,B + 2qId\,B \qquad (21)$$

Where Ip = Photocurrent and Id = Dark current; and

B = Effective noise bandwidth of the receiver.

The quantity σ_s is the root-mean-square (RMS) value of the noise current induced by shot noise.

3.2 Crosstalk Noise

Crosstalk noise is consists of an electric current due to interference channels. Crosstalk can be defined as [14, 16]:

$$\sigma_c^2 = 2qI_{CT0}B + 2qI_{CT1}B \qquad (22)$$

The quantity σ_c is the root-mean-square (RMS) value of the noise current induced by crosstalk power.

Where, I_{CT0}= Crosstalk Photocurrent when bit "1" is transmitted, and I_{CT1}= Crosstalk Photocurrent when bit "0" is transmitted.

3.3 Thermal Noise

Total Thermal noise is given by [10, 16]:

$$\sigma_{th}{}^2 = \frac{4kTB}{R_L} \qquad (23)$$

Where R_L = Load Resistance;

T = Absolute temperature and

k= Boltzmann constant,

And B = Bandwidth = $\frac{1}{2\pi R_L C}$

IV. At Receiver End

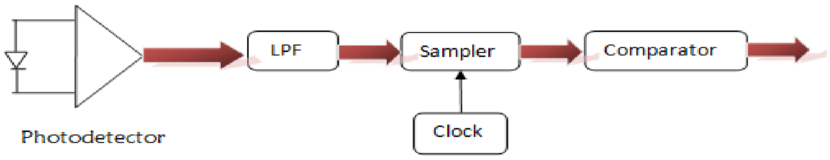


Figure 2: Receiver Design

4.1 Signal To Noise Ratio

The Signal to Noise Ratio is [10,11]:

$$(SNR)_{PIN} = \frac{P_{signal}}{P_{noise}}$$

$$= \frac{I_S{}^2 R_L}{P_{Shot} + P_{thermal} + P_{crosstalk}} = \frac{I_S{}^2 R_L}{\sigma_s{}^2 + \sigma_{th}{}^2 + \sigma_c{}^2}$$

$$(SNR)_{PIN} = \frac{I_S{}^2 R_L}{2eBI_p + 2eBI_d + \frac{4kTB}{R_L} + \sigma_c{}^2} \qquad (24)$$

Where Ip=Photocurrent and Id=Dark current of the detector.

4.2 Crosstalk Noise Power

Where $\sigma_c{}^2$ = Crosstalk noise power, can be defined as:

$$\sigma_c{}^2 = 2 \int_{\lambda_1+\frac{B}{2}}^{\lambda_2-\frac{B}{2}} |S(\lambda-\lambda_2) * R(\lambda)|^2 \, d\lambda \qquad (25)$$

This Crosstalk power is only for λ_2 channel, if there is 2 interference channel λ_1 *and* λ_3 exist [14,16].
Here B = Channel Bandwidth and
$R(\lambda)$=Reflectivity of $\lambda_2 = \frac{|k_{ac}|^2 \sinh \gamma L^2}{|k_{ac}|^2 \cosh \gamma L^2 - \delta^2}$

4.3 Signal To Crosstalk Ratio (SCR)

Now the Signal Power is given by:

$$P_s(\lambda) = \int_{\left(\lambda_B-\frac{B}{2}\right)}^{\left(\lambda_B+\frac{B}{2}\right)} |S(\lambda)R(\lambda)|^2 \, d\lambda \qquad (26)$$

Where $\lambda_B =$ Bragg Wavelength $= \lambda_2$
Now the Signal to Crosstalk ratio is given by:

$$SCR = \frac{Signal\ Power}{Crosstalk\ Power} = \frac{P_s(\lambda)}{P_c(\lambda)}$$

$$SCR = \frac{(P_s R_d)^2}{\sigma_c{}^2 + \sigma_s{}^2 + \sigma_{th}{}^2} \qquad (27)$$

$$\mathrm{SCR(dB)} = 10 \times \log_{10}\left[\frac{(\mathrm{P_s R_d})^2}{\sigma_c{}^2 + \sigma_s{}^2 + \sigma_{th}{}^2}\right] \qquad (28)$$

Now by putting, $I_1 = R_D . P_s$, where $R_D = 1$ and $I_D = \frac{I_1}{2}$

$$\mathrm{BER} = \frac{1}{2}\mathrm{erfc}\left[\frac{1}{2\sqrt{2}} \frac{\mathrm{P_S}}{\sqrt{\sigma_c{}^2 + \sigma_s{}^2 + \sigma_{th}{}^2}}\right] \qquad (29)$$

V. Results and Discussion

The theoretical analysis are presented in previous sections, following the performance results of an optical WDM system based on Fiber Bragg gratings are evaluated with effect of crosstalk due to interference channels and System's SCR and BER of given number of wavelengths with several value of channel separation and Bandwidth are shown.

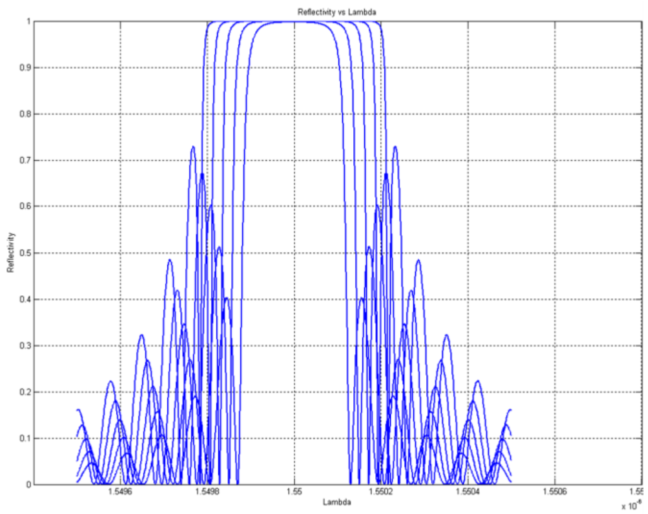


Figure 3: Normalize Reflectivity of uniform for Bragg wavelength 1550nm with variation in Bandwidth.

Figure 3 shows the Normalize reflectivity power as a function of wavelength with different number of Bandwidth (B). Here Bandwidth B=0.2nm=2*Rb, where Rb=Bit Rate of the sample.

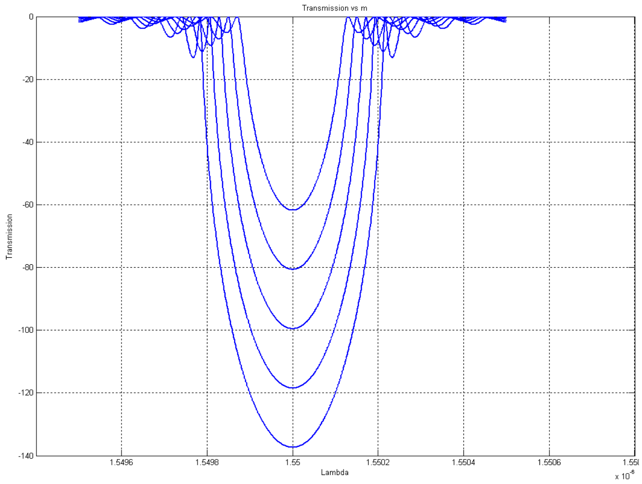


Figure 4: Normalize Transitivity of uniform Bragg for 1550nm Bragg wavelength

Figure 4 shows the Transmitivity of uniform grating for 1550nm Bragg wavelength with different Bandwidth (B).

5.1 Crosstalk Power, SCR and BER

To observe crosstalk power (Pc) ,Signal to Crosstalk Ratio (SCR) and the bit error rate (BER) performance of WDM system using FBG-OC based Dmux, we stimulated previous equation. To evaluate BER, the following system parameters are chosen here:

$T = 300\ K, k = 1.38 \times 10^{-23}$,

$R_L = 100\ \Omega$,

number of channels $(\mathrm{N}) = 32$,

bit rate $R_b = 12.5\ Gb/s$,

Channel specing $\mathrm{D_{ch}} = 25 GHz\ to\ 64 \times df$

Channel Bandwidth $B_{ch} = 25\ GHz$

The Ratio $m = \dfrac{D_{ch}}{B_{ch}} = 1$ to 1.5

5.1.1 Case 1:

5 Channel WDM system With 1st And 5th Channel is OFF:

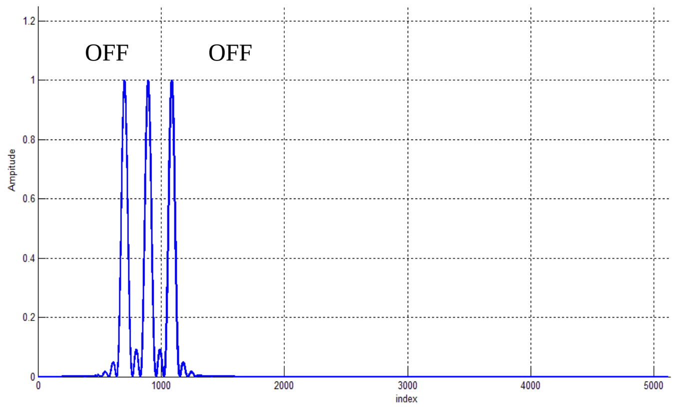
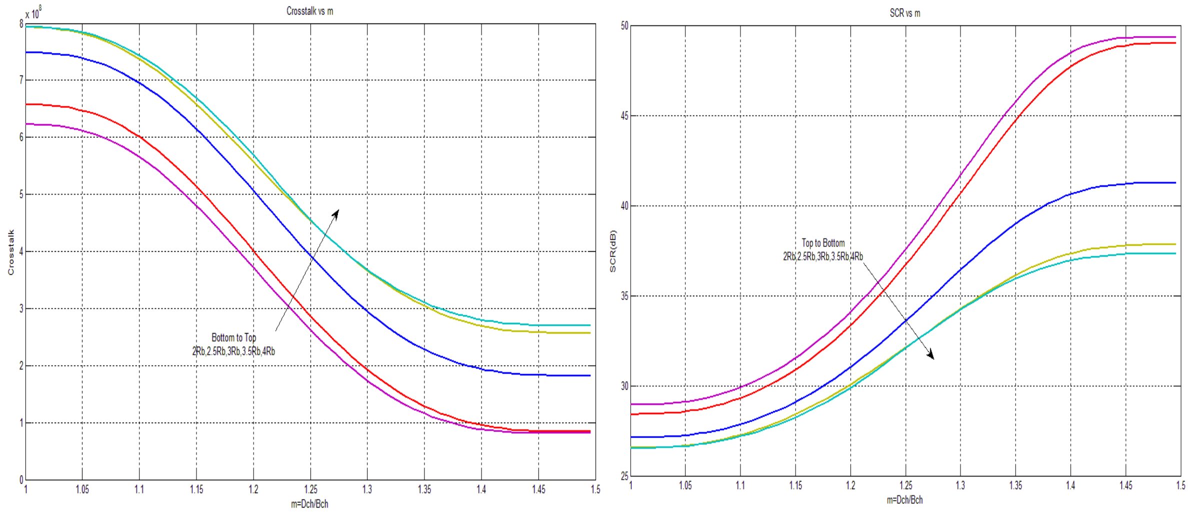


Figure 5: 5 channel WDM system considering 1st and 5th channel is off (Worst Case)

Here Figure 5 shows a 5 channel WDM system. The 3rd channel is interferes with 4 interference channels at Bandwidth 4*Rb. Here we consider 1st and 5th channel is off.

We consider worst case with the mid-channel (3rd) as the desired signal channel & others are interference channels. After filtering the desired channel, it is obvious that there will be some portion of interference channel, which interfere in getting the actual signal. This interference produces crosstalk



(a) (b)

Figure 6: Crosstalk (a) and SCR (b) vs m=Dch/Bch with 5 channel WDM system considering 1st and 5th channel is off (Worst Case).

Plots of Crosstalk versus Normalized channel separation are plotted in figure 6 (a). Here crosstalk of 2 interference channels enter within the signal. In this case Crosstalk Power increases with increase in value of Bandwidth (B). It is observed that more Crosstalk is added with increase of Bandwidth (B) and Crosstalk power decreases with increase in Normalize channel separation, m=(Dch/Bch). While separation of channel increasing less crosstalk enters to the signal comparing previous position.
Plots of SCR versus Normalized channel separation are plotted with different value of Bandwidth in figure 6 (b). Here crosstalk of 2 interference channels enter within the signal. In this case, SCR decreases with increase in value of Bandwidth (B). Because it is observed that more Crosstalk is added with increase of Bandwidth (B) and Crosstalk power decrease with increase of Normalize channel separation, $m = (D_{ch}/B_{ch})$. Again, SCR increases with the channel separation increases. Because while separation of channel increasing less crosstalk enters to the signal comparing previous position.

TABLE 1: Evaluation of Crosstalk for case 1

Bandwidth (B)	Channel spacing (Dch)	Crosstalk
2*Rb 2.5*Rb 3*Rb	Dch(min) = Bch = 25 GHz	6.22e+008 6.57e+008 7.49e+008
2*Rb 2.5*Rb 3*Rb	Dch(max) = 25 GHz+64*df	0.80e+008 0.84e+008 1.82e+008

TABLE 2: Evaluation of SCR for Case 1

Bandwidth (B)	Channel spacing (Dch)	SCR
2 * Rb 2.5 * Rb 3 * Rb	Dch(min) = Bch = 25 GHz	28.93 dB 28.40 dB 27.11 dB
2* Rb 2.5* Rb 3* Rb	Dch(max) = 25 GHz+64*df	49.33 dB 48.98 dB 41.25 dB

5.1.2 CASE 2:

5 Channel WDM System with 4th Channel is OFF:

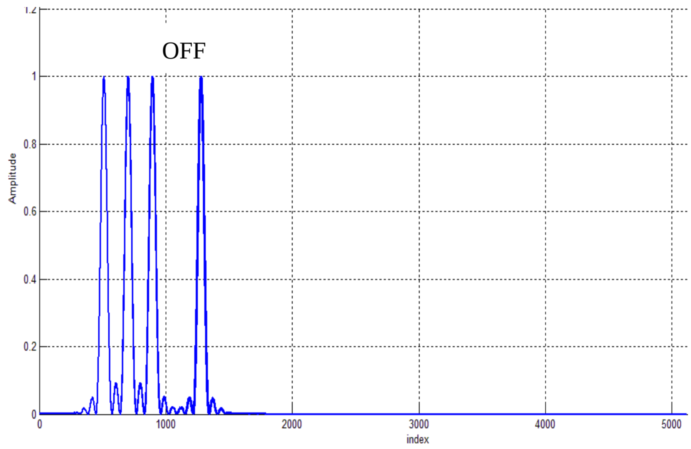
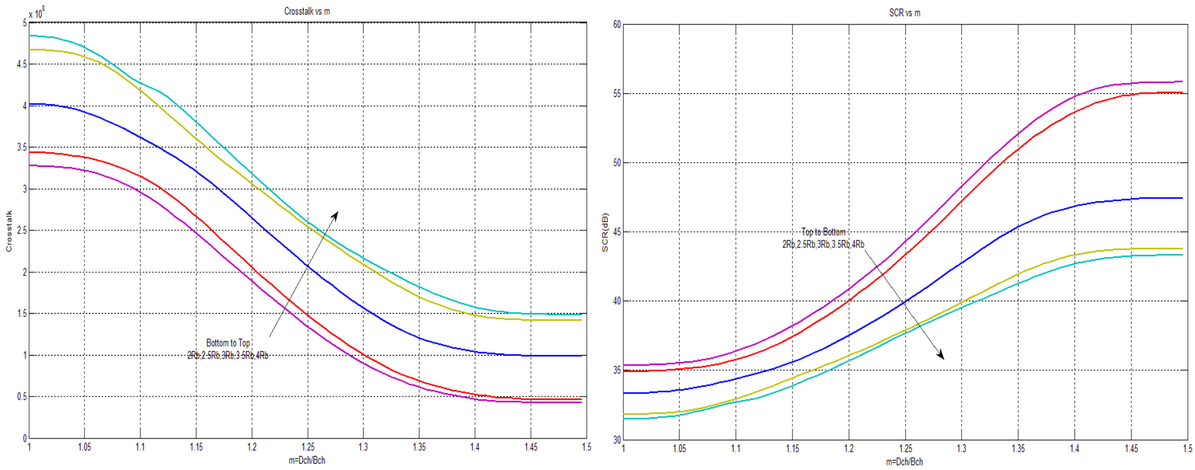


Figure 7: 5 channel WDM system considering 4th channel is off

Figure 7 shows a 5 channel WDM system. The 3rd channel is interferes with 4 interference channels at Bandwidth 4*Rb. Here we Consider 4th channel is off.



(a) (b)

Figure 8: Crosstalk (a) and SCR (b) vs m=Dch/Bch with 5 channel WDM system considering 4th channel is off.

Plots of Crosstalk versus Normalized channel separation are plotted considering 4th channel is off in figure 8 (a). Here crosstalk of 3 interference channels enter within the signal. In this case, Crosstalk Power increases with increase in value of Bandwidth (B).
In figure 8 (b) considering 4th channel is off, here crosstalk of 3 interference channels enter within the signal. In this case SCR decreases with increase in value of Bandwidth (B) Again, SCR increases with the channel separation increases. Because of disappear of 4th channel less crosstalk power is enter within the mid channel as 3rd channel

TABLE 3: Crosstalk Evaluation for Case 2

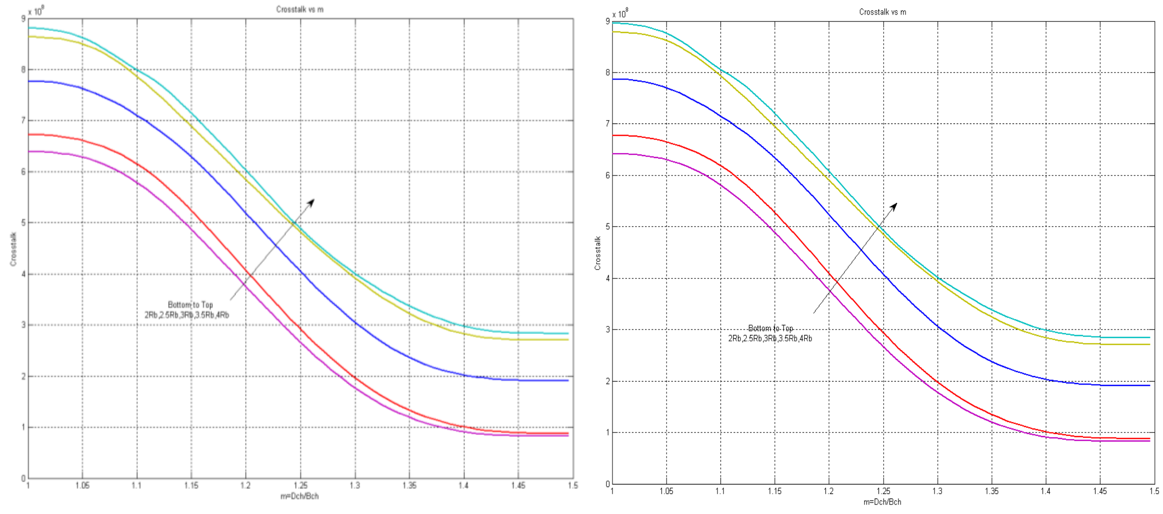
Bandwidth (B)	Channel spacing (Dch)	Crosstalk
2*Rb 2.5*Rb 3*Rb	Dch(min)=Bch=25 GHz	3.27e+008 3.43e+008 4.01e+008
2*Rb 2.5*Rb 3*Rb	Dch(max)= 25GHz+64*df	0.42e+008 0.45e+008 0.98e+008

TABLE 4: Evaluation of Signal to Crosstalk Ratio for Case 2

Bandwidth (B)	Channel spacing (Dch)	SCR
2*Rb 2.5*Rb 3*Rb	Dch(min)=Bch=25 GHz	35.36 dB 34.90 dB 33.34 dB
2*Rb 2.5*Rb 3*Rb	Dch(max) = 25 GHz+64*df	55.79 dB 55.03 dB 47.42 dB

5.2 Crosstalk Vs. "m" With Different Channel Bandwidth (B)

Figure 9 (a) and Figure 9 (b) are evaluating the Crosstalk Power against Normalized Channel Separation m=(Dch/Bch) for the mid-channel at the worst case scenario with different Channel Bandwidth B=2Rb to 4Rb for 5 & 9 Channel WDM System having 4 & 8 interference channel respectively.



(a) (b)

Figure 9: Crosstalk Power vs Ratio m with different Channel Bandwidth (BW) for 4 interference channels (a) and 8 interference channels (b).

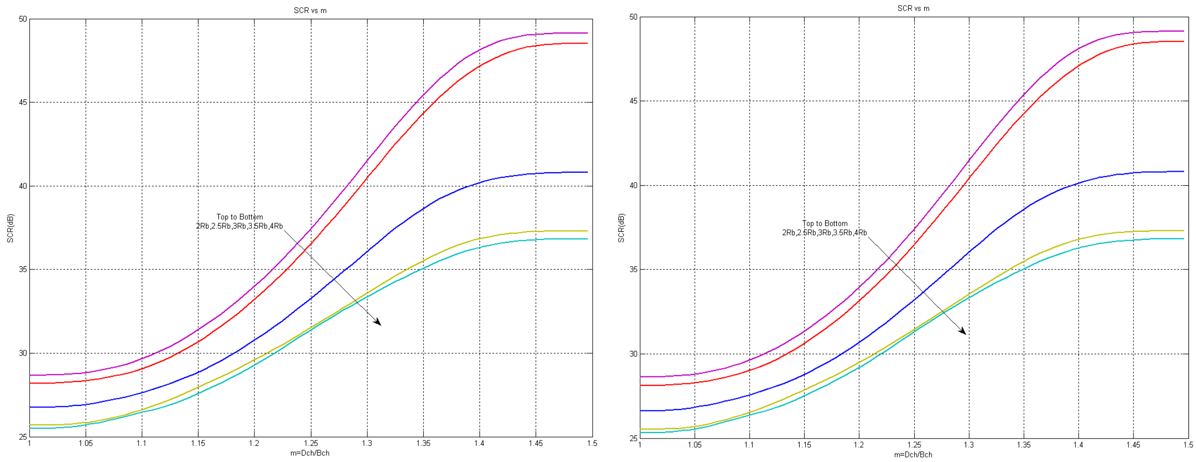
Plots of Crosstalk versus Normalized channel separation are plotted with different channel Bandwidth (B) for 5 channels WDM system in figure 11.

For 9 channel WDM system, the crosstalk power decreases with the channel separation increases. Because while separation of channel increasing less crosstalk enters to the signal comparing previous position. Nevertheless, the value of crosstalk power is higher for 9 channel WDM system than 5 Channel WDM System.

5.2.1 Discussion

We observed in the case of 4 & 8 Interference channels that more Crosstalk occurs in 8 interference channel rather than 4 interference channels with same Bandwidth (B) and same Normalized Channel Separation m. However, with 16 interference channels, crosstalk does not change so much and with 32 interference channels, considerations are negligible.

5.3 SCR Vs. "m" With Different Channel Bandwidth (B)



(a) (b)

Figure 10: Signal-to-Crosstalk Ratio (SCR) vs. Normalized Channel separation m with different Channel Bandwidth (B) with 4 interference channels (a) and 8 interference channels (b).

5.3.1 Discussion

We observed in the case of 4 & 8 Interference channels that SCR is lower in 8 interference channel rather than 4 interference channels with same Bandwidth (B) and same Normalized channel separation m. with 16 interference channels, SCR does not change so much and with 32 interference channels, considerations are negligible.

5.4 SCR Vs "m" With Different Value Of Bit Rate (Rb) At BER 10^{-12}

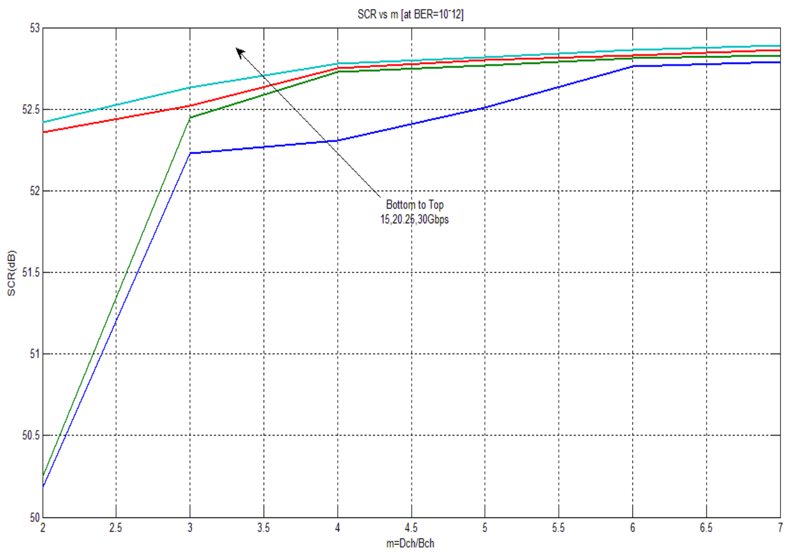


Figure 11: Signal-to-Crosstalk-ratio (SCR) vs. Normalized Channel Separation m at BER 10^{-12} of a WDM system FBG based DMUX with different value of Bit Rate Rb. where m=Dch/Bch.

The Plots of Signal-to-Crosstalk-ratio (SCR) vs. Normalized Channel Separation m at BER 10^{-12} are shown in figure 11 with different value of Bit Rate (Rb).

In this figure, Bit rate is varied from 15Gbps to 30 Gbps.

It is noticed that with increase in Bit Rate (Rb), there is increase in SCR with respect to different values of m=Dch/Bch.

5.5 BER VS. SCR WITH DIFFERENT BANDWIDTH (B)

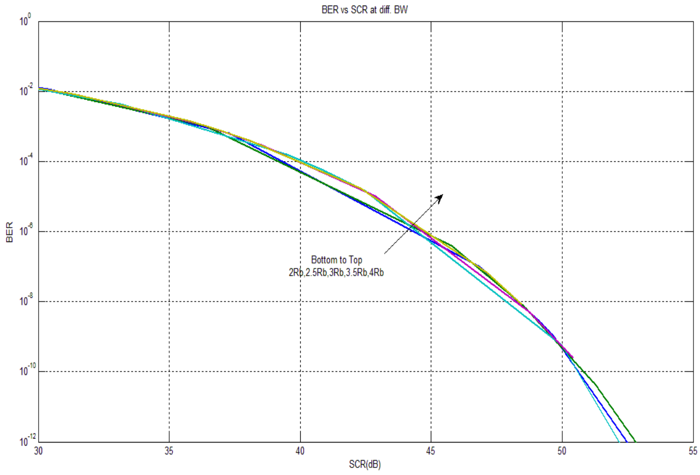


Figure 12: Bit-error-rate (BER) vs. Signal-to-Crosstalk-ratio (SCR) at the receiver end of a WDM system FBG based DMUX with different number of m. where m=Dch/Bch.

Fig 12 shows the BER against Signal to crosstalk ratio (SCR) for the channel positioned 3rd with the different value of the Bandwidth (B) with 4 number of interference channels. In this configuration, BER increases with increase in Bandwidth (B) and BER decreases with SCR. It is observed that less BER found with more SCR for 5 wavelength channels.

5.6 BER VS. SCR WITH DIFFERENT VALUE OF "m"

Here Figure 13 shows the BER against Signal to crosstalk ratio (SCR) for the channel positioned 3rd with the different value of the Ratio (m) of Channel spacing (Dch) and Channel Bandwidth (Bch) with 4 number of interference channels

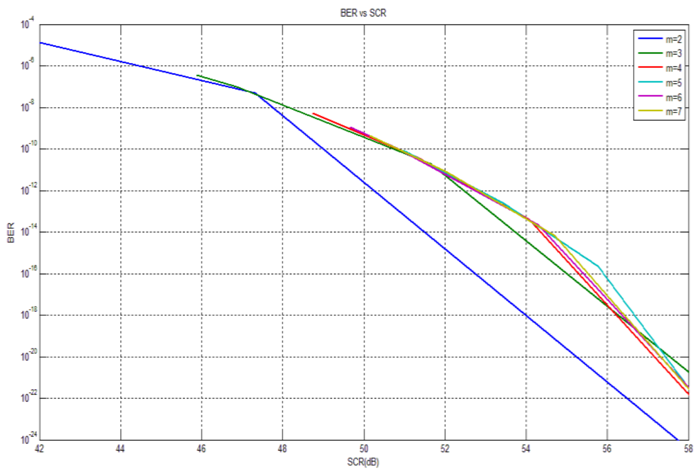


Figure 13: Bit-error-rate (BER) vs. Signal-to-Crosstalk-ratio (SCR) at the receiver end of a WDM system FBG based DMUX with different number of m. where m=Dch/Bch.

In this configuration, BER increases with the Ratio m increases and SCR increases. It is observed that more BER found with more SCR for 4 interference channels.

VI. CONCLUSION

Crosstalk and the BER performance of FBG-OC based WDM system are evaluated and different factors that are affected the magnitude of crosstalk and BER in the OADM system also analyzed. We found in analysis that BER is increased with the number of wavelength channels increases. The main problem of such kind of OADM is that Crosstalk and BER are also increases significantly as the Bandwidth (B) of the channel increases. However, BER is not affected with more than 16 wavelength channels. Here we have given some of our outcome results from all analysis.

Further works can be carried out with amplifier-induced crosstalk in a WDM network. With an Optical Pre-Amplifier and Amplifier, there should have some ASE noise and Intraband crosstalk limitations in the WDM system.

ACKNOWLEDGEMENTS

The authors would like to thank Prof. Dr. Satya Prasad Majumder, BUET for supervising us.

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