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

Vol.5., Issue.4, 2017
July-August

REVIEW ARTICLE

ISSN: 2321-7758

REVIEW ON OPTICAL LOGIC GATES

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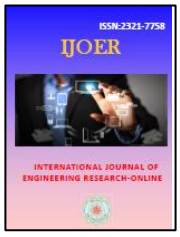


ABSTRACT
This paper shows the various methods for implementation of optical logic gate. In optical communication the devices is having the nonlinearity behaviour that causes the Four wave mixing (FWM) and Cross gain modulation (XGM) is called the semiconductor optical amplifier (SOA). This occurs due to variation in reflective index and gain. The optical logic gate is device the device which performs the logic operation like electrical logic with the use of optical component. The inputs and output terminal are in the form of light. The logic gate which can be implemented by the SOA are AND, NAND, OR, NOR EXOR. All optical gates are the main elements for the generation of node functionalities add drop unit multiplexing, packet synchronization, clock recovery and signal processing,
Keywords: Logic Gate, All-Optical Data Processing, SOA, XGM.

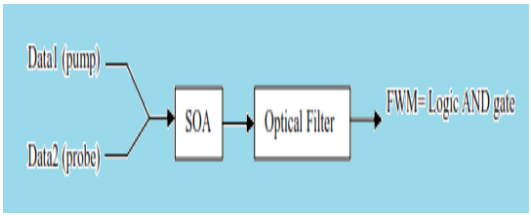
INTRODUCTION

CROSS PHASE MODULATION (XPM

In WDM communication, different pulses propagates with different wavelength. The changing in refractive index in optical fiber is occurred due to the simultaneously propagation of beams. Then change in refractive index will affect the other beam wavelength this is called the cross phase modulation [1-3].

In WDM system, pulses in optic fiber propagate at distinct wavelength. If we consider light beam at two different frequencies propagating simultaneously through a fiber, change in refractive index brought about by each beam will affect the other beam. This is experienced as deceive phase modulation (XPM) in which signal pulses randomly encroach up on in stantaneously. This gives random noise of the channel resulting right and valuable bit error rate. If pulses have antithetical frequencies, once their velocity will be different. So there prospective walk-off mid the two pulses [4-7].

If these pulses start moving together they will separate as they propagate and resulting in higher dispersion. To degrade the dispersion, their velocity should be near to each other.



FOUR WAVE MIXING

The four waves mixing (FWM) is a process, in which interaction of waves produces the new frequencies[8-9]. It is given by two or more frequency beating to each other in SOA structure than new frequencies generates. So a Four wave mixing is the promising method for wavelength conversion and this is independent to the modulation format used in the design and having capability of dispersion compensation. It is also having the capability of multi wavelength conversion. This method possesses the low wavelength conversion efficiency the required the care full control of polarization [10-12].

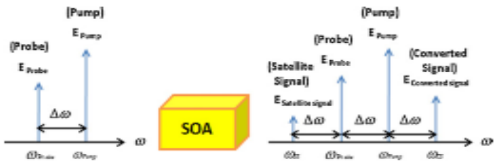


Fig.1 Four wave mixing

Analysis Of Design : Following figure are given in below show the logic operation in the optical domain where inputs and output both are the in the light domain. Fig .1,5 shows the OR gate operation .

The principle of operation for the AND gate (Figure 1,5) . In this case, the data sequences which is used for the operation are compared applied to the SOA-MZI. The signals applies at ports 1 and port 3, while in port 2 a zero level signal must be ensured. There is no need of an additional control signal as the data signals entering the common port enables or disables the device. Following a similar principle than that of the XOR gate, an optical pulse will be obtained at the output only in the case that both data signals are "1". In this case (A = 1, B = 1), the pulse of data B enables the operation. In an alternative way, the AND operation can be seen as performing the XOR comparison between data A and a zero levelsignal. When B=0, the gate does not produce any signal at the output as it has no signal atport 3. In the last case in which B = 1 and A = 0 the comparison is enabled, but as the signal at port 1 and the signal at port 2 are zero, no power is obtained at the output of the device.

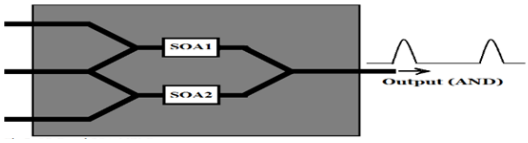


Fig.2 Optical logic AND gate using SOA by cross gain modulation

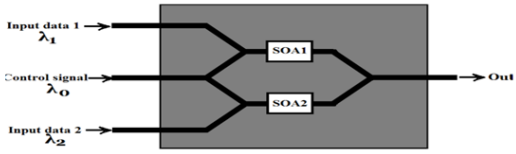


Fig.3 Optical logic EXOR gate using SOA

Similar other logic gate can be implemented on the basics of principal given for the logic AND operation Figure 1to 5 gives the optical logic gate operation

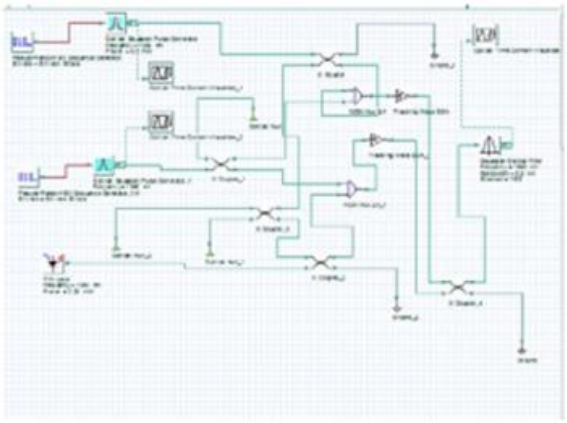


Fig.4 AND Gate using SOA

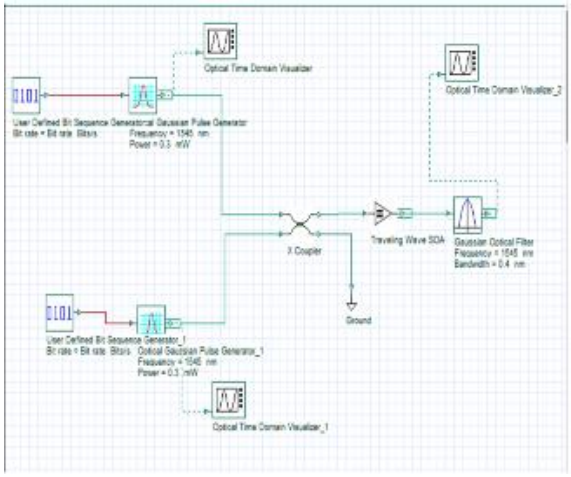


Fig.5 OR Gate implementation using SOA

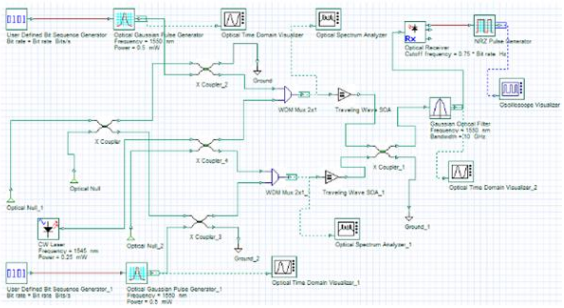


Fig.6 EXOR gate implementation using SOA

Conclusion

The simple and stable structure of SOA-MZI, the concept of optical gate is possible. The nonlinearity effect is generated in device due to the power variation of optical wavelength and mixing of wavelength. The utilization of optimum condition of SOA we can implement the logical operation in optical domain. The four wave mixing and cross gain modulation are main effect which is responsible for the generation of optical domain logic gate. The paper shows formation of optical logic gate using the SOA.

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