New design of optical logic universal nor gate

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Abstract: **Paper suggests the new technique of NOR Gate design for the simple structure. In this design we used the cross gain modulation for generating the NOR operation. 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: Cross gain Modulation, Nonlinear effect, Logic gates, Four wave mixing (FWM).

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1 Introduction:

CROSS PHASE MODULATION (XPM):-

In WDM communication, a different pulse 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.
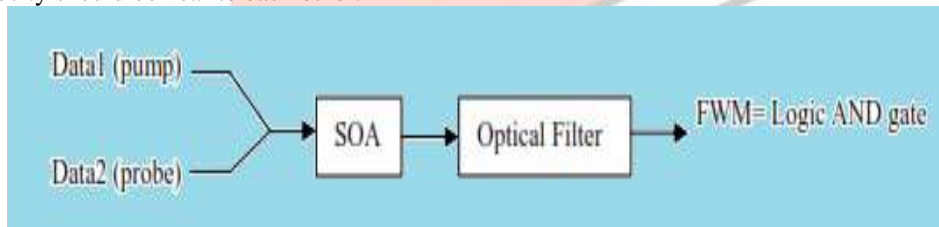

Fig.1 Four wave mixing AND gate

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].
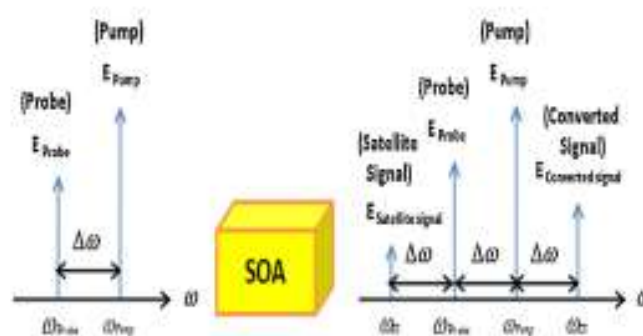

Fig.2 Four wave mixing

2 Proposed Design

In this method, We used the cross gain modulation technique for implementation of the NOR gate. When any one of the input data bit is logic '1' then in this case any signal combined with the external signal and this high power signal degrade the power of external signal which is to be filter at the band pass filter so the output is always low. The output is '1' when the both input optical pulse is high('1'). The Fig.3 Show the simulation of design.
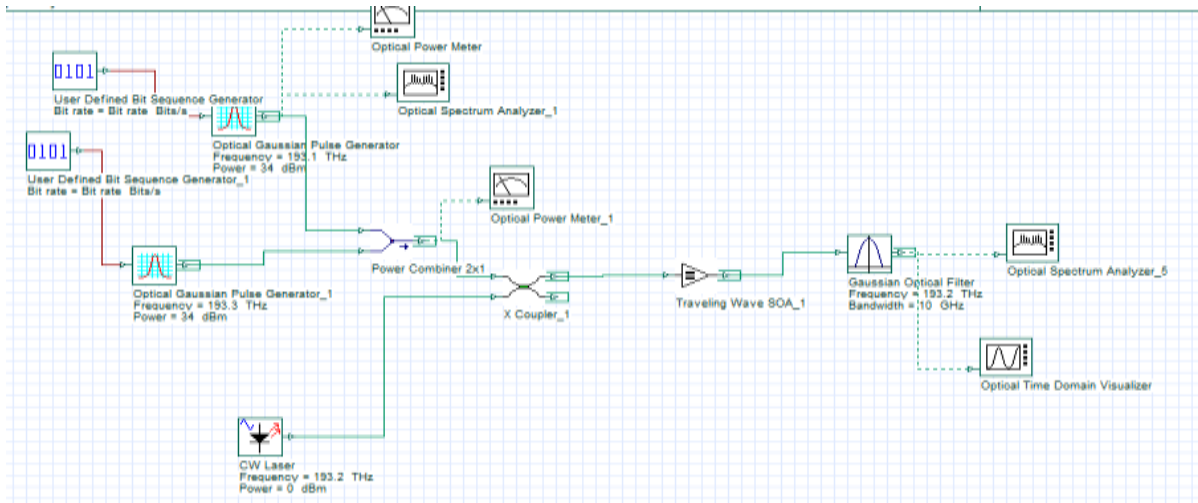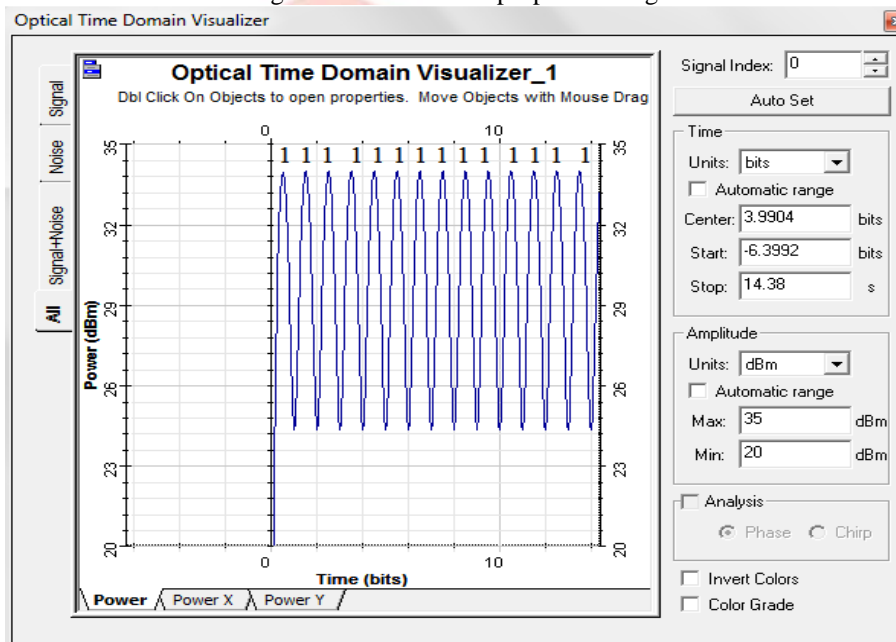

Figure.3 Simulation of proposed design

Figure.4 Input of optical logic gate

Figure.5 Input of optical logic gate

Figure.6 Output of optical logic gate

3 ANALYSIS

The input pulse is denoted by the optical spectrum 193.1THz for logic '1' and 0THz for the logic '0'. The output is denoted by the 193.2 THz (Logic '1').

Fig.4 and Fig.5 shows the input optical neither signals for the logical input and Fig .6 shows the output of the signal for basic Universal NOR gate.

Table.1 Presentation of NOR gate

Input1	Input2	Output
193.1THz (Logic '1')	193.1THz (Logic '1')	0 THz (Logic'0')
193.1THz (Logic '1')	0 THz (Logic'0')	0 THz (Logic'0')
0 THz (Logic'0')	193.1THz (Logic '1')	0 THz (Logic'0')
0 THz (Logic'0')	0 THz (Logic'0')	193.2 THz(Logic '1')

4 CONCLUSION

This paper present the simplest design of the universal logic NOR gate in optical domain so this universal gate supports the any logic gate . The design is based on the nonlinear effect . The cross gain modulation is the one of the nonlinear effect which is utilized properly to implement the NOR gate with the less number of optical components.

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