January-February 2020
ISSN: 0193-4120 Page No. 17744 - 17749

STUDY ON DESIGNING OF FEASIBILITY OF NON-SEMICONDUCTOR OPTICAL AMPLIFIFIER DEVELOPMENT ON HYBRID LOGIC CIRCUITS(NSOA-HLC)

SREENIVAS GADARI
Research Scholar, Dept. of Electronics and Communications Engineering, Sri Satya Sai University of Technology & Medical Sciences, Sehore, Bhopal-Indore Road, Madhya Pradesh, India
Dr.R.Praveena
Research Guide, Dept. of Electronics and Communications Engineering, Sri Satya Sai University of Technology & Medical Sciences, Sehore, Bhopal Indore Road, Madhya Pradesh, India

Article Info
Volume 82
Page Number: 17744 - 17749
Publication Issue:
January-February 2020

Article History
Article Received: *18 October 2019*
Revised: *14 November 2019*
Accepted: *12 December 2019*
Publication: *29 February 2020*

Abstract

Acousto-optic tunable filters (AOTF) are utilized to quickly and powerfully select a particular frequency from a broadband or multi-line laser source. As the applied RF frequency is fluctuated, the transmitted frequency changes, tuning the wavelength of the beam or picture in microseconds or less. The Acoustic Optic Tunable Filters (AOTF) is an electro-optical devices that capacities as an electronically tunable excitation channel to at the same time tweak the wavelength and intensity of various laser lines from one or more sources. This paper explores the attainability to create general hybrid AND and OR gates which can be utilized for actualizing any essential circuits or any complex logic circuits. These hybrid logic circuits are proposed and actualized utilizing Acousto-optic tunable filters (AOTF).

Keywords: *AOTF, Optical, Wavelength, Crystal, Semiconductor, Logic Circuits and Non-SOA;*

INTRODUCTION

The essential activity rule is explained in the accompanying. On the off chance that a sinusoidal (fixed-frequency) RF input signal is applied to the modulator, diffraction is conceivable just in a limited scope of optical frequencies, where a stage coordinating condition including both optical and acoustic waves is satisfied. Taking a gander at the diffracted light, one gets a band pass channel, while the non-diffracted light gives a step channel. With RF spreads of various frequencies, one can address various locales of optical frequencies. One may, for example, utilize an optical input from an argon particle laser radiating on various laser lines, and with the tunable channel one can transmit only each of those lines in turn. It is likewise conceivable to utilize any superposition of various RF frequencies so as to get diffraction for various optical frequencies. The diffraction productivity at any wavelength can be controlled by means of the corresponding RF power. Contingent upon the plan, an AOTF may work over an optical wavelength extend which is many nanometres wide. Different devices are upgraded for high goals in a smaller wavelength go. Some of them

Published by: The Mattingley Publishing Co., Inc.

additionally work with ultrashort heartbeats. An acousto-optic tunable channel (AOTF) is a sort of optical channel which depends on a sort of acousto-optic modulator. Wavelength tuning is electrically controlled through the applied RF frequencies.

The optical frequency of light is as it were more major then the optical wavelength. For example, a molecule or particle exposed to light can't "see" the wavelength since its size is just an extremely little portion of it. It basically just registers a quick wavering, i.e., the optical frequency. In the event that that frequency corresponds with certain inward pitches frequencies, thunderous excitation procedures can happen. The inward resounding frequencies are not identified with some separation equivalent to the optical wavelength. In any case, for historical reasons it is more typical to indicate wavelengths instead of optical frequencies of light. For example, Nd:YAG lasers working on their standard laser change are generally said to emanate light with 1064 nm vacuum wavelength, as opposed to with a frequency of 282 THz. This is basically on the grounds that optical wavelengths could before long be dictated by utilizing different sorts of interferometers, though it was troublesome in the early occasions to quantify or even to assess optical frequencies.

A gate is an electronic component which is utilized to process a capacity on a two esteemed signal. Logic gates are the essential structure square of advanced circuits. Essentially, all logic gates have one output and two inputs. Some logic gates like NOT gate or Inverter has just one input and one output. The inputs of the logic gates are intended to get just double information (just low 0 or high 1) by getting the voltage input. The low logic level speaks to Zero volts and high logic level speaks to 3 or 5 volts positive flexibly voltage. We can associate any number of logic gates to plan a necessary advanced circuit. For all intents and purposes, we actualize the enormous number of logic gates in ICs, by which we can spare the physical space involved by the huge number of logic gates. We can likewise perform entangled tasks at high speeds by utilizing integrated circuits (IC). By joining logic gates, we can plan numerous particular circuits like flip flops, latches, multiplexers, shift registers and so on.

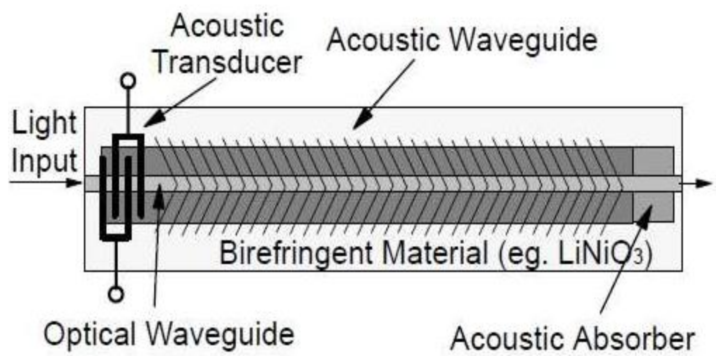

FIGURE 1. ACOUSTIC OPTICAL TUNABLE FILTER

LITERATURE REVIEW

Saif Hasan Abdulnabi (2019)

In this paper, Author proposed that, dissect and reproduce another setup to re-enact all-optical combinational logic capacities dependent on Nano-rings insulator-metal-insulator (IMI) plasmatic waveguides. We utilized Finite Element Method (FEM) to examine the proposed plasmatic combinational logic capacities. The examined combinational logic capacities are Half-Adder, Full-Adder, Half-Subtractor, and Comparator One-Bit. The activity rule of these combinational logic capacities depends on the productive and damaging obstructions between the input signal(s) and control signal. Numerical re-enactments show that a transmission edge exists (0.25) which allows all proposed four plasmatic combinational logic capacities to be accomplished in one structure. Subsequently, the transmission edge esteem quantifies the performance of the proposed plasmatic combinational logic capacities. We utilize a similar structure with similar measurements at 1550 nm wavelength for all

Published by: The Mattingley Publishing Co., Inc.

TEST Engineering & Management

January-February 2020
ISSN: 0193-4120 Page No. 17744 - 17749

proposed plasmatic combinational logic capacities. The proposed all-optical combinational logic capacities structure contributes fundamentally to photonic integrated circuits development and all-optical signal handling Nano-circuits.

Hyun-chul Park (2014):

In this paper, Author proposed that, the improvement of (sub) THz transistor advancements, high speed integrated circuits up to sub-THz frequencies are presently possible. These high speed and wide bandwidth ICs can improve the performance of optical segments, intelligent optical fiber correspondence, and imaging frameworks. In current optical frameworks, electrical ICs are utilized basically as driving amplifiers for optical modulators, and in recipient chains including TIAs, AGCs, LPFs, ADCs and DSPs. In any case, there are various possible applications in optics utilizing high speed ICs, and various methodologies might be required for more effective, conservative and flexible optical frameworks. This thesis will talk about three unique methodologies for optical parts and correspondence frameworks utilizing high speed ICs: a homodyne optical stage bolted circle (OPLL), a heterodyne OPLL, and another WDM recipient design. The homodyne OPLL collector is intended for short-connect optical correspondence.

4. PROPOSED METHODOLOGY

Diodes can act like switches, so these are utilized in advanced logic tasks and exchanging. For low and high impedance expresses a diode will work in forward predisposition and converse inclination. The diode will lead just one way (Forward inclination) and it stays shut backward predisposition condition. So it carries on like a switch. Presently how about we see some basic diode logic gates, which are built by utilizing just Diodes and resistors. The straightforward OR gate structured by two diodes is appeared in the below figure. Two inputs are given to this circuit by the diodes. In this, the logic HIGH (1) is spoken to by +5 Volts and logic LOW (0) is spoken to by 0 Volts or Ground. In the circuit below, the two inputs are left detached, so the output is 0 for example logic low. On the off chance that any of the two inputs is associated with +5 volts, at that point the diode gets forward one-sided and it will direct .Thus the output is logic HIGH for example 1. On the off chance that voltage of +5 V is associated with both the inputs (the two diodes), they will be in forward one-sided state, which makes the output of OR circuit to set in HIGH logic. The working of OR gate is scientifically given as Y= A + B, where Y is the output of the OR gate and A, B are the inputs. Reality table and logic chart and circuit outline for the logical OR gate is demonstrated as follows.

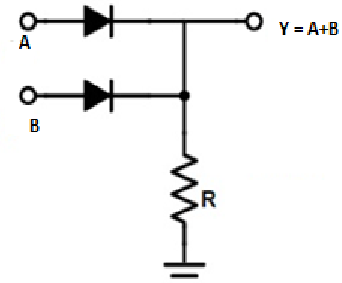

FIGURE 2. OR CIRCUIT

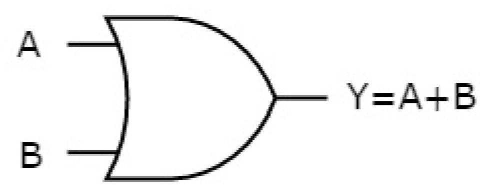

FIGURE 3. OR DIAGRAM

The basic AND gate planned by two diodes is appeared in the below figure. In this the circuit driving voltage V is associated with the two parallel associated diodes through a resistor, R. two inputs are given to this circuit by the diodes. In this, the logic HIGH (1) is spoken to by +5 Volts and logic LOW (0) is spoken to by 0 Volts or Ground. In the below circuit, the two inputs are left detached, so the output

Published by: The Mattingley Publishing Co., Inc.

January-February 2020
ISSN: 0193-4120 Page No. 17744 - 17749

is likewise 0 for example logic low. On the off chance that any of the two inputs is associated with +0 volts , then the diode gets converse one-sided and it won't lead and makes the output as LOW logic for example 0. On the off chance that the voltage of +5 V is associated with both the inputs (the two diodes), both the diodes will be in forward one-sided state, which makes the output of AND gate to HIGH or bit 1 logic. The working of AND gate is numerically given as Y = A.B, where Y is the output of the AND gate and A, B are the inputs. Reality table and logic chart and circuit outline for the logical AND gate is demonstrated as follows.

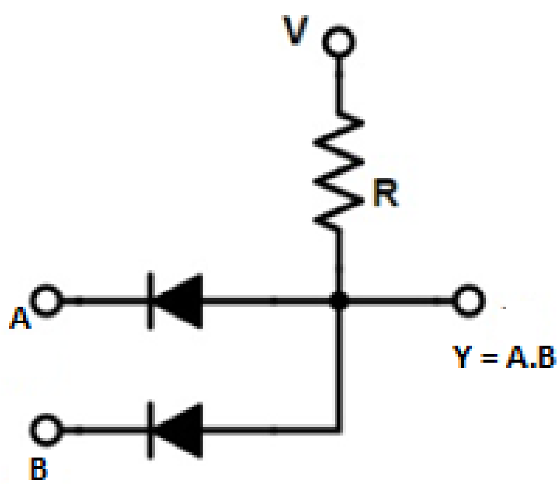

FIGURE 4. AND CIRCUIT

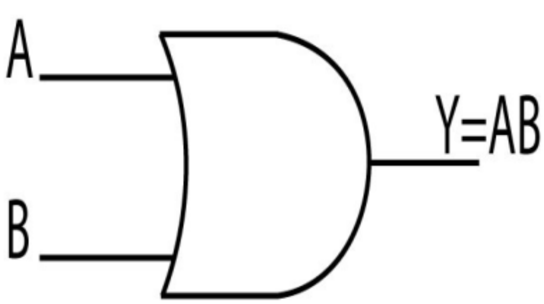

FIGURE 5. AND DIAGRAM

AOTF & MODULATION

Since the necessities for various applications are very assorted, various sorts of acousto-optic filters have been created. Collinear filters are generally productive yet have a restricted precise acknowledgment run. A few devices utilize a collinear cooperation among light and sound waves. For example, one may utilize a tellurium oxide (TeO2) precious stone, having a high acousto-optic figure of legitimacy, and apply acoustic shear waves (i.e., with the swaying opposite to the beam heading). The diffracted light will at that point have a polarization bearing which is opposite to that of the straight enraptured input light. It is accordingly simple to segregate the diffracted light after the device with a polarizer. Such devices have a little acknowledgment edge, i.e., they work just with a suitably adjusted laser beam having a constrained measure of beam uniqueness.

OPTICAL INTEGRATED LOGIC GIRCUITS:

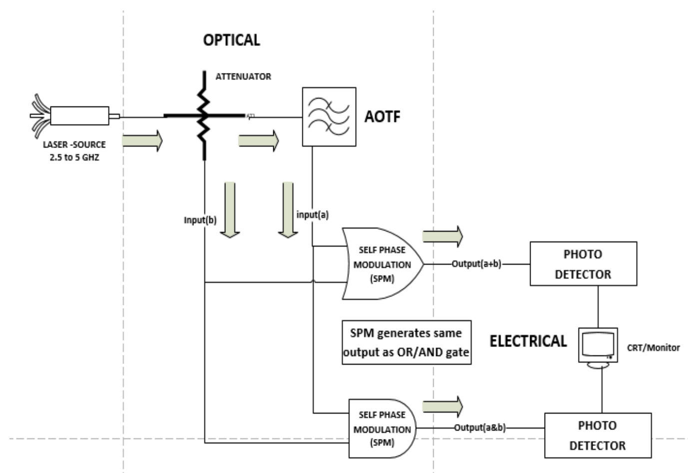

FIGURE 6. OPTICAL HYBRID LOGIC CIRCUITS

Input source is laser beam of 2.5 to 5 GHZ and given to attenuator which reduces the speed of laser beam to make it compatible with other devices. SPM modulates the input laser signal after filtering out by AOTF. The SPM output is given to photodetector which converts light energy in to electric energy. Finally we can see the output in CRO. Our system generates the same output as AND/OR gate and discussed in result part. Non-collinear filters might be better for applications requiring enormous

January-February 2020
ISSN: 0193-4120 Page No. 17744 - 17749

acknowledgment points. There are likewise tunable filters dependent on a non-collinear geometry. These ordinarily have an a lot bigger acknowledgment point, however just a very restricted association length, with the goal that the diffraction proficiency is correspondingly decreased, or higher RF powers are required. A few devices can work with an unpolarised input, exploiting the birefringence of the pre-owned precious stone material. Distinctive channel plans can vary enormously regarding different performance boundaries, for example, the addressable scope of optical wavelengths, the unearthly goals and nature of side lobe concealment, and the diffraction productivity and required RF power. The prerequisites of the pre-owned RF driver likewise rely especially upon the device structure and its application.

The below schematic diagram indicates how the AOT filter is working to remove diffracted lights. AOTF allows only un-diffracted lights to pass through to next device. Hence the terminal device will not affect from diffracted lights.

INPUT = OPTICAL SIGNAL such as white lights

OUTPUT = Un-diffracted light

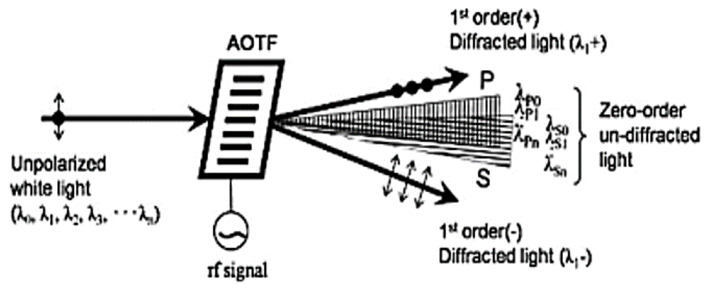

FIGURE 7. AOTF

5. EXPERIMENTAL RESULT

Our simulation output is as same as actual output of AND/OR gate. Hence we proved that our system works properly and simulated successfully.

TRUTH TABLE OF LASER INPUTS A, B& ACTUAL AND/OR GATE OUTPUT

Input a	Input b	Output (a+b)	Output (a&b)	Simulation Result
1	1	1	1	1
0	0	0	0	0
1	1	1	1	1
0	0	0	0	0

TABLE 1. TRUTH TABLE

FIGURE 8. SIMULATION OUTPUT

Published by: The Mattingley Publishing Co., Inc.

TEST Engineering & Management

January-February 2020
ISSN: 0193-4120 Page No. 17744 - 17749

CONCLUSION

The input and output signals are configured in Table1. Overlapping signal A with signal B produces an output signal with the pattern 1010& 1010, which is the correct proof for characteristics of an AND& OR logic gate. Therefore, the optical hybrid AND as well as OR gate has been successfully demonstrated at constant speed provided by attenuator. The optical hybrid logic circuits has been realized by using the static characteristics of the SPM wavelength converter.

REFERENCES

1. Nahmias M A, Shastri B J, Tait A N, Ferreira de Lima T and Prucnal P R 2018 Neuromorphic photonics Opt. Photonics News 29 34–41
2. Egel E, Csaba G, Dietz A, 2018 Design of a 40-nm CMOS integrated on-chip oscilloscope for 5–50 GHz spin wave characterization AIP Adv. 8 056001
3. Youplao P et al 2018 Plasmonic op-amp circuit model using the inline successive microring pumping technique Microsyst. Technol. 24 3689–95
4. Ji X, Barbosa F A S, Roberts S P, Dutt A, Cardenas J, Gaeta A L and Lipson M 2017 Ultra-low-loss on-chip resonators with sub-milliwatt parametric oscillation threshold Optica 4 619–24
5. Chen Y C et al 2017 Laser writing of coherent colour centres in diamond Nat. Photon. 11 77–80
6. Ren H, Aktas O, Franz Y, Hawkins T and Peacock A C 2017 Tapered silicon core fibers with nano-spikes for optical coupling via spliced silica fibers Opt. Express 25 24157–63
7. Suhailin F H, Shen L, Healy N, Xiao L, Jones M, Hawkins M, Ballato J, Gibson U J and Peacock A C 2016 Tapered polysilicon core fibers for nonlinear photonics Opt. Lett. 41 1360–3
8. Shuntaro T, Takase K and Furusawa A 2018 On-demand photonic entanglement synthesizer arXiv:1811.10704

Published by: The Mattingley Publishing Co., Inc.