Sudan University of Science and Technology
College of Postgraduate Studies

Design and Construction of a Controlled Laser Switch

A thesis submitted to the institute of laser as a partial fulfillment of requirement for the degree of M.Sc. in laser application/physics

By: Mohammed Margani Rashed Abass

Supervised By: Dr. Mubarak Almahal Ahmed
بسم الله الرحمن الرحيم

قال تعالى:
((الله نور السموات والأرض مثل نوره كمشكاة فيها مصباح المصباح في زجاجة الزجاجة كأنها كوكب دري يوقد من شجرة مباركة زيتونة لا شرقية ولا غربية يكاد زيتها يضئ ولو لم تمسسه نار نور على نور يهدى الله لنوره من يشاء وبضرب الله الأمثال للناس والله بكل شيء عليم))

صدق الله العظيم
(الإيه 35 من سورة النور)
I dedicate this thesis

TO my Father Souls

TO my Mother

And

my fiancée

TO Mohammed
Acknowledgement

I am so grateful to Dr. Mubarak Almahal who supervised this thesis. And also I thank prof. Nafi Abd Alateef for all his help and fruitful advices. My thank fall short to his great help and kind guidance. My thanks to Dr. Gais Abd Alstar who provided valuable equipment. My thanks to Dr. Elfatih Ahmed Hassan, Department of Chemistry. A lot of thanks to my brother Osama. I thank Dr. Hussien Yousif of the Department of Statistics and Computers in Shendi University.

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Abstract

A laser control system was designed and constructed in this work. Diode laser with wavelength 670nm and output power 1mW was used to operate the 555 timer and JK flip-flop for a different time intervals. The time high had been calculated and measured through the capacitor value of the circuit.

The response of the electronic circuit was tested to work with different lasers. (i.e. He-Ne laser 632.8nm with output power 1mW, diode laser 820nm with output power 75mW, and using the diode laser 670nm, with output power 1mW).

The electronic circuit was responded for all the lasers with wavelength in the visible portion only.

To operate the circuit by a single laser wavelength, a suitable filter was selected, then the circuit had been operate with the diode laser 670nm only.

This means that the electronic circuit was controlled and operated using one laser as switch.
The operation of the circuit by using specific laser for different distances was tested, and showed that the maximum distance for the diode laser (670nm), was 50 meter.

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الخلاصة

في هذا البحث تم تصميم وتشغيل منظومة تحكم الكترونية تعمل بالليزر. استخدم ليزر الثنائي ذي الطول الموجي 670 نانوميتر وبقدرته 1 ملي وات لتشغيل الموت (55) وكذلك مرجاح JK ويفترات زمنية مختلفة حيث تم حساب وقياس زمن التشغيل من خلال تغيير قيمة المكثف في الدائرة. تم اختبار استجابة الدائرة الإلكترونية للعمل مع ليزرات مختلفة مثل ليزر الهيليوم نيون (632.8) نانوميتر بقدرته 1 ملي واتوليزر الثنائي (820) نانوميتر بقدرته 75 ملي وات وليزر الثنائي (670) نانوميتر بقدرته 1 ملي وات. استجابة الدائرة الإلكترونية للليزرات ذات الأطوال الموجية المرئية فقط. بهدف جعل الدائرة الإلكترونية تعمل بليزر واحد تم اختيار مرشح مناسب حيث استجابة الدائرة لليزر الثنائي (670) نانوميتر فقط ولم تستجيب للليزرات الأخرى ووفقا لذلك تم التحكم في تشغيل الدائرة الإلكترونية بواسطة ليزر ذي طول موجي واحد.
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