

# IMPLEMENTATION OF LASER SECURITY SYSTEM

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## ABSTRACT

*This research study looks at the planning, execution, and assessment of a laser-based security system. The system establishes a perimeter and uses laser transmitters and receivers to disrupt laser beams to detect incursions. The paper focuses on system sensitivity and reliability while addressing technical topics including signal processing and beam modulation. Through testing and analysis, the study confirms the laser security system's efficacy and provides information about its potential for practical uses in vital domains including asset security and perimeter defense.*

*A laser security system is an advanced technology designed to secure a space using laser beams. This system includes laser transmitters and receivers strategically placed to form a protective perimeter. When an intruder disrupts the laser beams, it triggers an alarm or activates security measures. The abstract highlights the effectiveness of the system in enhancing security, its adaptability to different environments and its potential applications in different sectors, emphasizing the combination of precision optics and modern security technologies.*

**Keyword:** - laser, security system, LDR, signal buzzer

## 1. INTRODUCTION

Every person has the fundamental need for security. A calm existence is reliant on the perception that we have been safe and that everything is in order. Yet how can one feel secure in this perilous world where dangers, crime, and terror are at an all-time high? To keep safe and dependable, more and more people are installing laser security systems because they offer us a solution in this situation. At home and in other significant businesses, a variety of electronic security systems can be employed for safety and security reasons. One tool utilized for security is a laser security alarm. Its applications in the fields of defense and security are numerous and range from protecting basic household items to safeguarding extremely valuable organizational assets. They were once pricey fixes for security issues. This type of security system is getting more inexpensive because to cost savings and quick technology advancements.

There are several key ways in which lasers are not like other light sources. Security systems need to perform two tasks. The beam of a laser light is narrow, unlike that of a flashlight or lightbulb. Furthermore, laser light is basically monochromatic. Due to its limited dispersion, laser light may be directed across great distances and yet contain sufficient energy in a confined space to activate a security system detector.

Due to its single wavelength, the detector may be made to pass the laser light while keeping out ambient light by applying a blocking filter. The path of laser light is straight. For instance, you may position the detector in one corner and the laser in the other to guard the front of the yard. It is not a particularly practical setup, though. Usually in cases where the room's perimeter needs to be strengthened or protected. Thus, the first step of a laser security system is to aim a laser at a tiny mirror. The beam is directed towards the second small mirror by tilting the first mirror, and so on until the last mirror directs the beam at the detector

## 2. LITERATURE SURVEY

Harshal Hemane, Debarati Sen [1] et al., explains that a laser beam is nearly invisible and may travel a great distance without experiencing any scattering. The only areas that are visible are the impact and radiation points. Thus, we may establish an imperceptible boundary around the critical area using this security project. There are two components to the system. The receiver is the other and the transmitter is the first. A switch, two dry batteries, a laser emitter, and an attaching stand are all included with the transmitting portion. A focused LDR (light dependence resistor) sensor for continuous LASER sensing is present on the receiver side. The LDR sensor is connected to the exciter's main circuit and maintains equilibrium with the stand. There are actually two parts to the circuit. The beam discontinuity signal filters one, while an alert circuit filters the other. The alarm circuit turns on when an individual passes the invisible beam since the main circuit uses the sensor to identify the discontinuity.

K. Raviraj, N. Phaneendra, et al., [2] et al., explains that this is founded on the idea of a voltage divider circuit. Because of the LDR's reduced resistance, there is very minimal voltage drop across it when the laser beam is incident on it constantly. Moreover, due to the shift in LDR resistance, there is a large voltage drop across the laser beam when it gets blocked by an object or barrier. This triggers the circuit's alarm or siren. This is a fairly fundamental project that enabled us to depend more on the components that we typically utilize in our labs and slightly improved our knowledge.

Singha, Suman, and Debasis Maji [3] et al., explains that photoconductivity is the term used to describe the occurrence of photon-induced conduction. And this occurs when a material's conductivity is altered by photon radiation, causing a significant number of electrons to shift into the conduction band. That kind of photoresistor is also an LDR. An electrical component called a photoresistor has resistance that varies with light. An LED's electrical resistance value is high in the dark (several Meg ohms) and low in the presence of light (as low as 50 ohms). The photoelectric effect is the basis for its operation. A semiconductor with outstanding resistance builds up the photoresistor. As high-frequency light approaches the device, the photons are absorbed by the semiconductor's elasticity, which provides the electrons with enough power to travel through the conduction band. The resistance decreases as a result of the released electron resulting in and the gap that it generates conducting electricity. Typically varies from 100  $\Omega$  under strong light to 1 MW or more in the dark.

Lafta, Montather Nassr, [4] et al., explains that utilizing locks and alarms on windows and doors is a common deterrent against break-ins of this kind. A new security system is proposed in this study, and it is built using light-dependent resistors (LDR) and a multi-laser alarm system. Just as in action movies, a number of lasers are employed to detect movement in a given area. This is predicated on the voltage divider circuit principle. Because of the LDR's decreased resistance, there is a very little voltage drop across it whereas the laser beam is continuously focused on it. The voltage drop across the laser beam increases when it is disrupted by an object or barrier because the resistance of the LDR changes. This sounds the siren or alarm on the circuit.

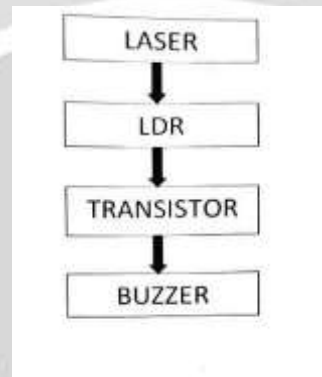
Arienne B. [5] et al., explains that the photon beam is coherent and focused; coherent in this sense denotes that all of the photons are present at a single wavelength as opposed to regular light, which is scattered throughout a vast spectrum. In this way, the laser can be utilized in conjunction with an alarm system to activate the latter when an object gets in the way of the laser and a light-dependent resistor (LDR). Components whose resistance varies according to the amount of light they receive are known as light-dependent resistors, or LDRs. Applications for

this include laser security systems and other light-sensing circuits. The Arduino will program this part to start the alarm by transmitting a signal to the alarm when the laser path is blocked.

Rai, Ashis, [6] et al., explains that the LDR serves as a sensor. Around the world, a variety of security systems have been invented and developed. nowadays, they're considered the most important to our everyday existence due to the rise in criminal organizations. It also served to eliminate water in cities. In considering these issues, we carried out research into low-cost laser alarm systems, which are publically available and provide a high degree of security. In the house or workplace, the laser light security system serves as both a tiny warning system and a security system.

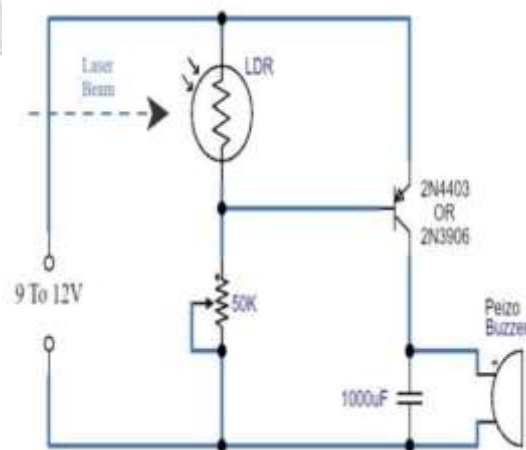
### 3. METHODOLOGY

This project develops a straight forward, affordable, and reliable laser safety system.



**Fig-1:** Block diagram

In order to produce an output, the Op-Amp circuit first acts as a comparator, compares the voltage across the inverting and non-inverting terminals. 10 K $\Omega$  LDR Resistance The Op-Amp's non-inverting terminal is connected to the voltage divider, and the inverting terminal is connected to the POT. Assume that the LDR's field of view has been filled with the laser pointer and that the laser's light is continuously incident on the LDR. The voltage at the non-inverting terminal will be lower than the inverting voltage when this happens because the resistance of the LDR will decrease to a few Ohms (or tens of Ohms). The transistor is off and the Op-Amp's output is low. The output of the op amp will go HIGH if an intrusive party prevents the laser light from impinging on the LDR, even for a little period of time. This is because the resistance of the LDR will rise to several hundred Ohms.

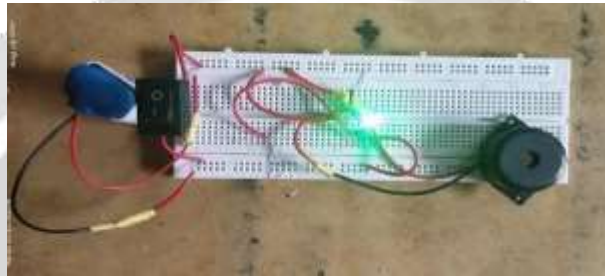


**Fig-2:** Circuit diagram

Since the 555 Timer IC's trigger pin (Pin 2) is connected to the transistor's output, if the transistor is on, the trigger pin will get a brief low pulse, which will cause the 555's output to go HIGH. By doing this, the buzzer on the alarm is set to activate. Because the 555 Timer IC is set up as a Bi-Stable Multivibrator, its output is set to HIGH by a brief active low trigger pulse on the trigger pin; to reset it, we must press the reset button. The alarm will not go off if you push, thus we will hide the reset button somewhere only the owner can see.

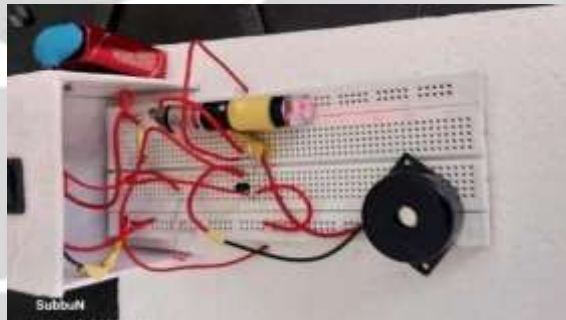
#### 4. RESULTS AND DISCUSSION

The LDR produces an output voltage and sounds an alarm to show the existence of any intruder when the laser beam incident through the device is disrupted by an object within the laser grid array. The design and development of the laser security system has been completed with success. The buzzer beeps when there's an interruption in the laser beam hitting the LDR. The circuit schematic was used to create the experimental model, and the outcome was anticipated.



**Fig-3:** Project Set-up

In order to prevent the second light source from being affected by the laser beam, the LDR needs to be positioned within the casing or in a dimly lit area. This facilitates faster and more accurate circuit operation.



**Fig-4:** Project Model.

#### 5. CONCLUSION

People install laser security systems to ensure their safety and well-being since they offer protection against theft and crimes in everyday life. For protection and safety reasons, a variety of electronic security systems might be utilized at home and in other significant workplaces. It is a fantastic chance and resource to preserve human energy and avoid wasting electricity. The "Laser Security System" is a crucial auxiliary system. With this technique, theft, robbery, and criminal activity can be largely prevented. Our financial assets are safeguarded while we kept thieves at bay, thus this method shields us from everyone.

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