Sudan University of Science and Technology

College of Engineering

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Industrial Alarm Protection System Using Laser

نظـام إنذار لحماية مصـنع بإستخدام اللـيزر

A Project Submitted in Partial Fulfillment for the Requirements of the Degree of B.sc. (Honor) in Electrical Engineering

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بسم الله الرحمن الرحيم

الآيـــــــــــة

قـال تعــالى :

(فَمَا ظَنُّكُمْ بِرَبِّ الْعَالَمِينَ)

صدق الله العظيم
سورة الصافات - الآية
87

DEDICATION

We dedicate our work to our families and many friends. A special feeling of gratitude to our loving parents.

We also dedicate this dissertation to our many friends who have supported us throughout the process.

ACKNOWLEDGEMENT

The greatest thanks to Allah always before and after .We would like to express our deep gratitude to everyone who helps us throughout this work at any step of it .Most grateful and appreciation to our supervisor Ust: jaffar babiker For their expertise support and endless valuable advices which guided us throughout this work and our engineering career life . Thanks all our teachers in the school of electrical and nuclear engineering for all the help and knowledge that they gave to us .and finally thankful be to everyone helped and contributed us from the beginning until to the completion of the B.Sc. degree, we hope improving reward and success for all.

ABTRACT

Wireless security systems can be easily controllable through a wireless remote or a touch tone phone from any place. Here main components of the laser security system are infrared motion sensors and a basic alarm unit. It works based on heat detection from a person's body in case of any security fault. Based on this alarm unit is triggered. The system alerts the security monitoring person and the local law enforcement body if required. At the same time a high pitched sound also sirens. There are two types of laser beams are available, green and infrared modules. System via an infrared module will be not visible. Another beam like green would be visible to the naked eye and serve as a deterrent purpose.

The main aim of this research is to:

- study main laser system components system and their applications.
- study the type of
-study the types of wireless communication.
- Interface wireless and telephone signal with laser signal to control the security system

مستخلص :

نظام الحماية اللاسلكية يمكن التحكم بها بسهولة عن طريق التحكم اللاسلكي عن بعد أو بواسطة إجراء مكالمة هاتفية من أي مكان. هنا تكون المكونات الأساسية لنظام التأمين بواسطة الليزر عبارة عن حساسات للحركة و وحدة تنبيه اساسية وهي تعتمد في مبدأ عملها على تحسس الحراره في جسم الإنسان في حالة وجود اي
إختراق أمني وبذلك تعمل على تشغيل وحدة التنبيه.
وتقوم بتنبيه الشخص المسئول عن الحراسه، وفي نفس الوقت تقوم بإصدار صوت عالي للتنبيه بأي إختراق.
يوجد نوعان من الليزر متوفر للإستخدام هما الليزر الأخضر وليزر الأشعه تحت الحمراء، والنظام الذي يستخدم الأشعه تحت الحمراء لا يمكن رؤيتها، والنظام الآخر الذي يعمل بالليزر الأخضر فيكون مرئي للعين المجرده ويستخدم لأغراض الحواجز.
الهدف الأساسي من هذه الدراسة:

- دراسة مكونات الليزر الأساسية ونظم تطبيقها.
- دراسة أنواع الإتصالات اللاسلكية.
- دراسة ربط إشارات الهواتف اللاسلكية مع الليزر في التحكم في نظم الحماية.

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LIST OF ABBREVIATIONS

Abbreviation	***Meaning***
LASER	Light Amplification by Stimulated Emission of Radiation
LDR	Light-Dependent Resistor
NO	Normally Open
NC	Normally Closed
BJT	Bipolar Junction Transistor
RF	Radio Frequency
MS	Mobile Section
WLAN	Wireless Local Area Network
PAN	Person Area Network
BAN	Body Area Network
UWB	Ultra Wide Bandwidth System

CHAPTER ONE

INTRODUCTION

CHAPTER ONE

INTRODUCTION

1.1 Background

The Laser security systems are high tech innovations that have gained popularity in home and office security systems. These are used to be expensive solutions for security needs. Depending on cost and fast technological advancements laser security systems becoming more adoptable. The features and specifications of the laser security system can be had in detail from the security system dealers who provide high end solutions based on requirement.

1.2 Problem Statement

The basic problem presented in the security system depends on human sources is very weak and that leads to stealing in the factories and stores and that causes over large losses because the keeper can be violate or sleep. Because of that the electronic protection system has a high reliability, efficiency and low cost compared with human security system because it uses a combination between the human security system and the security alarm system by using laser.

1.3 Objectives

The objectives of this project is to:

- Study the laser system components and applications.

- Study the wireless system, type and application.

- Get the ideal laser security system by using electronic components.

1.4 Methodology

A Model of a security system covering laser beam, wireless, Light Depended Resistor (LDR) and drivers has been implemented as a model with a suitable method tracking to design the laser security system.

1.5 Project Layout

This research consists of five chapters. Chapter one is introduction which consists background, problem statement, objectives and methodology. Chapter two is covering laser system, introduction, types and laser application. Chapter three deals about the wireless system, introduction and service types, Chapter four illustrates the practical application. Chapter five covers conclusion and recommendations.

CHAPTER TWO

LASER SYSTEM

CHAPTER TWO

LASER SYSTEM

2.1 INTRODUCTION

Lasers are devices that emit narrow beams of intense electromagnetic radiation (light). The term laser originated as an acronym for “light amplification by stimulated emission of radiation”. A laser beam has the special property that the light waves emitted are all in step with one another – coherent – and usually of one wavelength, or color. There are many different kinds of lasers, from giant installations emitting powerful pulses of high-energy radiation, such as X-rays, to tiny devices etched onto semiconductor chips producing infrared light.

Many different kinds of material can be made to “laser” – such as gases, crystalline solids, glasses and polymers – and which one is used depends on the application. Some lasers are designed to emit a continuous beam while others can spit out rapid pulses of light that are ultra-short. The wavelengths of light generated by certain types of laser can even be “tuned” for specific applications, making them extremely versatile.

Lasers offer a way of generating, controlling and directing intense light in remarkable ways, yet when they were first invented, physicists were not sure what they could be used for – they were famously described as a “solution looking for a problem”. In fact, although the first laser was constructed in the 1950s, practical applications did not appear until a couple of decades later – as is often the case in science. Since then, thanks to research activity in both university physics departments and companies, including those in the UK, lasers have become ubiquitous and are central to many technologies that are used in manufacturing, communications, medicine and entertainment. Today, lasers are key tools in

manipulating and communicating information (in CD and DVD players), supermarket barcode readers and broadband telecommunications), in measurement (surveying and environmental studies), chemical analysis (of foods, medical specimens and materials) and, increasingly, in transforming materials (welding, cutting and etching, printing, and surgery).

Research into lasers continues apace – new types of laser are being developed with a variety of characteristics and potential applications. In some cases, the result is a cheaper, more compact portable device designed for a specific use, or a more powerful laser used to generate power, for instance. UK university physics departments are at the forefront of many of these areas. In particular, physicists in the Central Laser Facility (CLF) at the Rutherford Appleton Laboratory develop novel high-powered laser systems and make them available for both pure and applied research.

The laser would never have been developed without a profound understanding of an area of fundamental physics – quantum theory. The principle behind the laser goes back to the world's most famous physicist, Albert Einstein. 17 proposed a theory of stimulated light emission. Einstein had previously shown that light was composed of tiny packets of wave energy called photons (the wavelength depending on the energy). Today, semiconductor diode lasers are the most common type, found in industry, commerce and the home.

2.2 laser Applications

Laser can be applied in many applications such as Information technology, telecommunications system, medicine, Manufacturing, measurement and analysis and scientific research.

2.2.1 Information technology

The largest application of lasers is in optical storage devices (e.g. CD and DVD players), in which a focused beam from a semiconductor laser, less than 1 mm wide, scans and reads the disc surface. Other everyday uses in clued barcode readers, laser printers and laser pointers. Over the past 25 years the publishing and newsprint industries have been revolutionized by the use of lasers, which have replaced traditional “hot metal” printing.

2.2.2 Telecommunications

The second largest application is in fiber-optic communications. Broadband depends on the transmission of light pulses along optical fibers, which are generated and relayed via lasers. This is made possible by fiber amplifiers, invented in the UK, which are an important component in long-distance fiber links.

2.2.3 Medicine

Lasers can deliver concentrated energy in the form of fine controllable light beams, so physicians soon took advantage of them to perform micro-surgery, which involves less pain and scarring, lower blood loss and shorter recuperation time in hospital. Laser beams delivered via flexible optical fibers allow surgeons to reach inside the gut, for example, and seal a bleeding ulcer. One of the most publicized uses of lasers is in eye surgery to treat disease and, increasingly, improve bad eyesight.

2.2.4 Manufacturing

Lasers can deliver enough power to heat and melt metal joints, and so are used for welding, as well as for cutting. When controlled by a computer, a laser can cut complex designs into a material such as wood or paper, as is increasingly being seen in furniture and other home goods.

2.2.5 Measurement and analysis

Lasers have long been used by the military for range-finding, but now even estate agents employ laser tape measures. Because lasers can be tailored to produce specific wavelengths, they are used to analyses chemical and physical structure, and so are used in factory quality control and to monitor environmental pollutants remotely. Lasers can be used for a type of measurement called interferometer which can measure tiny changes in distance.

2.2.6 Scientific research

Virtually every university science department in the UK relies on lasers for some aspect of its research programs – they have become indispensible research tools. Without lasers, many recent discoveries would never have been made, which illustrates the synergic relationship between developments in physics and other fields. Lasers interact with matter at the quantum level in very specific ways and so are important probes in research. They can be used to follow chemical reactions and elucidate structure at the atomic and molecular scale. Increasingly, life scientists are employing lasers in new types of microscopy designed to highlight cellular structures.

Physicists are continually developing new lasers and many UK teams are involved in these projects. These include nano scale devices that emit light and that are expected to find use in chemical and biological sensors on “lab-on-

a-chip" devices. The University of St Andrews, for example, has developed laser optical tweezers to manipulate biological cells to contribute to the burgeoning area of bio photonics. Several UK research groups are developing a new semiconductor laser called the quantum cascade laser, which promises to be an excellent source of terahertz radiation (between infrared and microwaves) now being introduced for national security screening. New laser technology will also play a role in developing the all-optical computer.

Researchers at the universities of Bath and Southampton pioneered a type of laser based on micro-structured optical fibers, which can produce light across the entire visible spectrum. Fiber lasers can be made to emit low-power light, allowing physicists to manipulate single photons. These are needed for fundamental experiments aiming to explore strategies underpinning the developing concept of quantum computing, which would allow the processing of unbelievable amounts of data, and also quantum cryptography, which offers an ultra-secure means of transmitting data.

Fiber lasers may also provide the next generation of very high power devices, producing X-rays for many kinds of enabling research, particularly in the life sciences. The European X-ray Free Electron Laser (XFEL), a large facility being constructed in Germany, is expected to offer X-rays at intensities not achieved before, and the UK is supporting this project. The UK's CLF also hopes to host the world's most powerful laser set-up, Hyper, which could demonstrate nuclear fusion as a potential clean, renewable source of energy.

Looking further ahead, researchers are undertaking nuclear physics research that could eventually lead to a gamma-ray laser to store nuclear energy, while exploitation of the atom laser might produce a whole gamut of new, and probably unanticipated, applications for the future.

Lasers are one of the most important enabling technologies to have been developed in the past 50 years and it is difficult to evaluate their impact. Lasers not only drive the modern information economy, allowing data to be transferred quickly across the internet and to be stored economically and efficiently, but they are also an essential research tool without which modern science, technology and medicine would not progress.

2.3 Types of Laser

Wave lengths of commercially available lasers. Laser types with distinct laser lines are shown above the wavelength bar, while below are shown lasers that can emit in a wavelength range. The color codifies the type of laser material (see the figure description for more details).

2.3.1 Gas lasers

Following the invention of the HeNe gas laser, many other gas discharges have been found to amplify light coherently. Gas lasers using many different gases have been built and used for many purposes. The helium–neon laser (HeNe) is able to operate at a number of different wavelengths, however the vast majority are engineered to laser at 633 nm; these relatively low cost but highly coherent lasers are extremely common in optical research and educational laboratories. Commercial carbon dioxide (CO2) lasers can emit many hundreds of watts in a single spatial mode which can be concentrated into a tiny spot. This emission is in the thermal infrared at 10.6 μm; such lasers are regularly used in industry for cutting and welding. The efficiency of a CO2 laser is unusually high. figure (2.1) shows the gas lasers

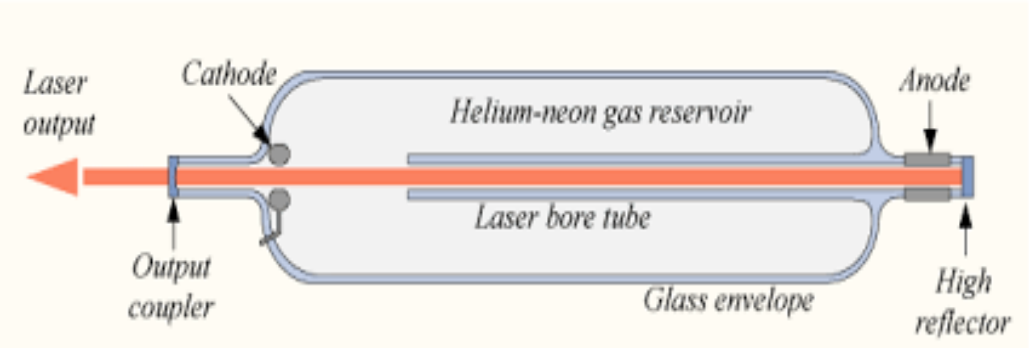


Figure 2.1: Gas lasers

2.3.2 Chemical lasers

Chemical lasers are powered by a chemical reaction permitting a large amount of energy to be released quickly. Such very high power lasers are especially of interest to the military, however continuous wave chemical lasers at very high power levels, fed by streams of gasses, have been developed and have some industrial applications. As examples, in the hydrogen fluoride laser (2700–2900 nm) and the deuterium fluoride laser (3800 nm) the reaction is the combination of hydrogen or deuterium gas with combustion products of ethylene in nitrogen trifluoride. Figure (2.2) shows the chemical lasers

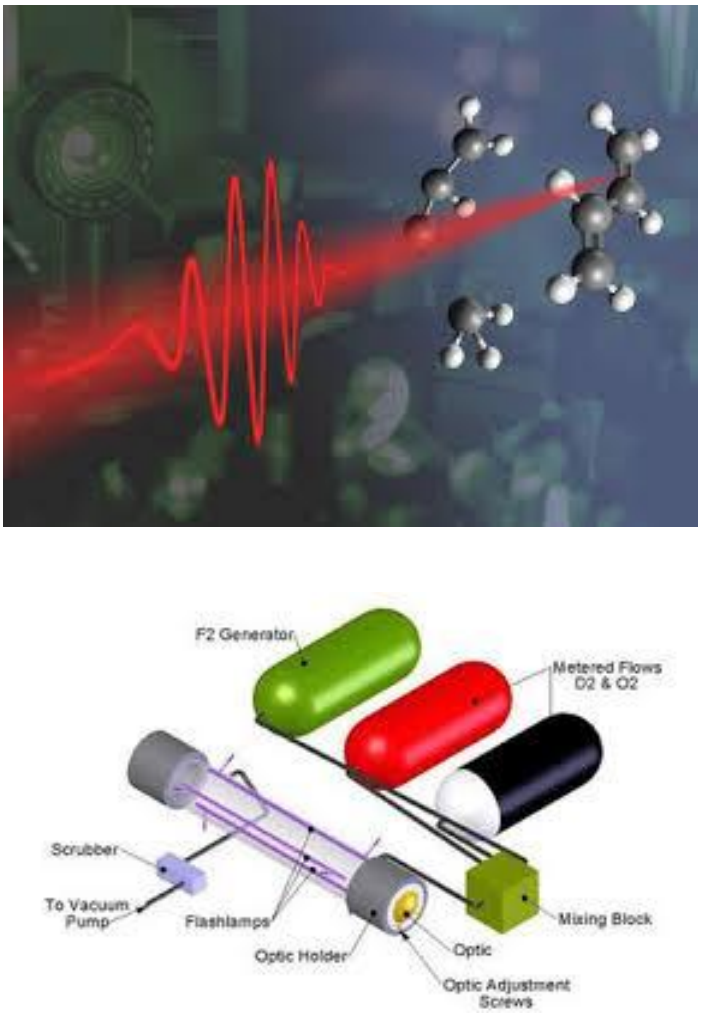


Figure 2.2: Chemical lasers

2.3.3 Excimer lasers

Excimer lasers are a special sort of gas laser powered by an electric discharge in which the lasing medium is an excimer, or more precisely an exciplex in existing designs. These are molecules which can only exist with one atom in an excited electronic state. Once the molecule transfers its excitation energy to a photon, therefore, its atoms are no longer bound to each other and the molecule disintegrates. This drastically reduces the population of the lower energy state thus greatly facilitating a population inversion. Excimers currently used are all noble gas compounds; noble gasses are chemically inert and can only form compounds while in an excited state. Excimer lasers typically operate at ultraviolet wavelengths with major applications including semiconductor photolithography and LASIK eye surgery. Figure (2.3) shows the Excimer lasers.

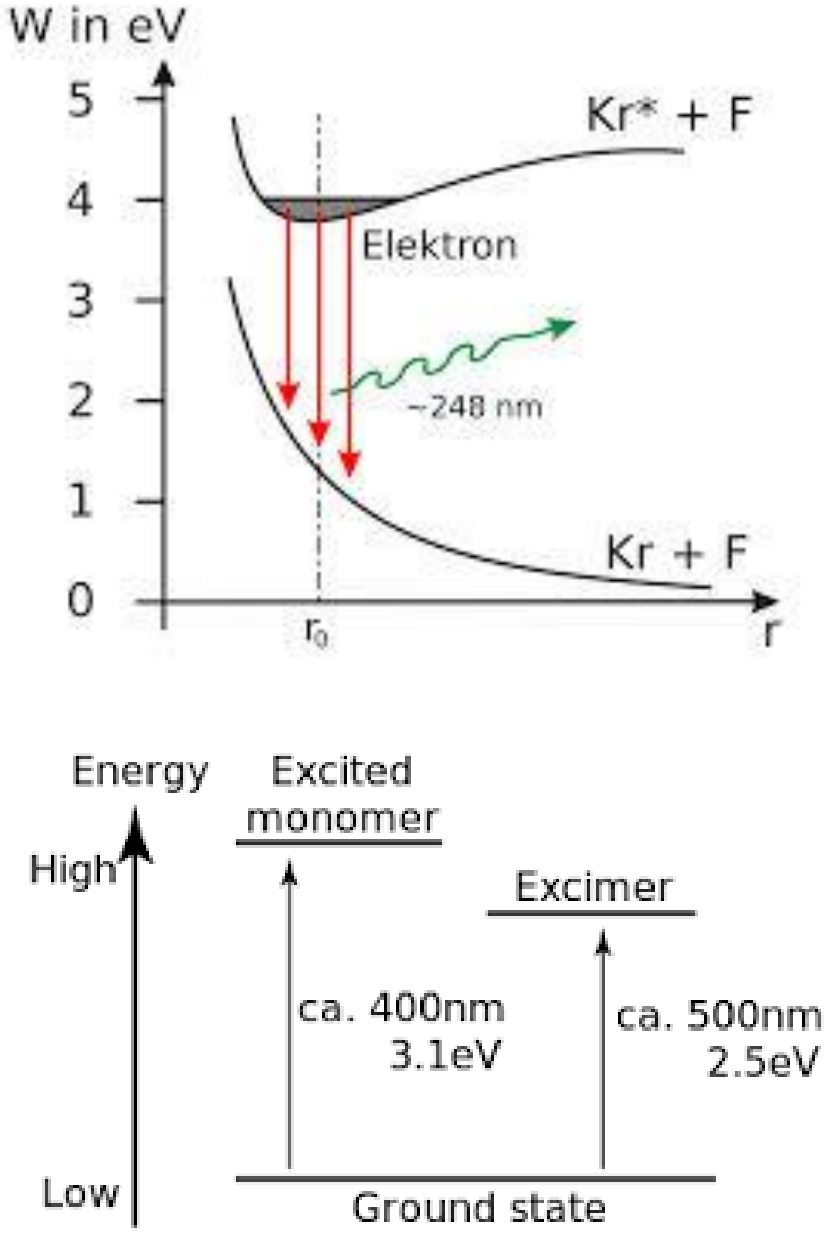


Figure 2.3: Excimer lasers

2.3.4 Solid-state lasers

Use a crystalline or glass rod which is "doped" with ions that provide the required energy states. For example, the first working laser was a ruby laser, made from ruby (chromium-doped corundum). The population inversion is actually maintained in the dopant. These materials are pumped optically using a shorter wavelength than the lasing wavelength, often from a flashtube or from another laser. The usage of the term "solid-state" in laser physics is narrower than in typical use. Semiconductor lasers (laser diodes) are typically not referred to as solid-state lasers. Figure (2.4) shows the solid-state lasers.

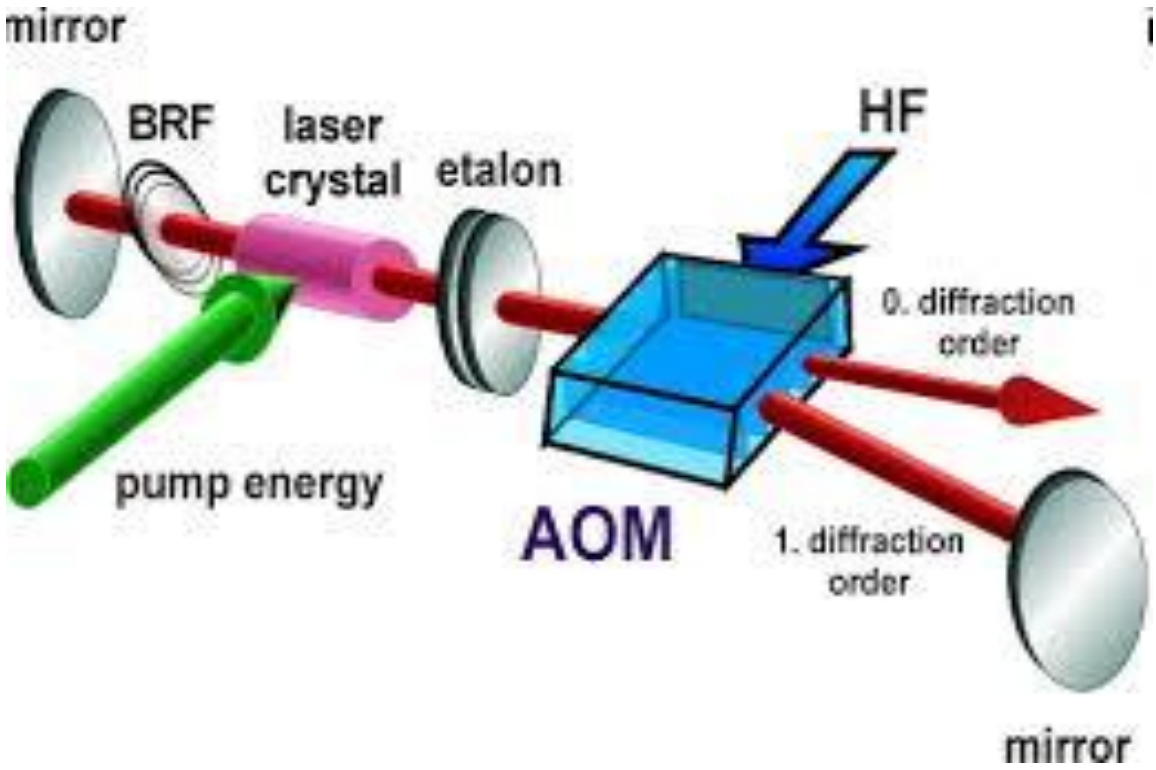


Figure 2.4: Soli-state lasers

2.3.5 Fiber lasers

Solid-state lasers or laser amplifiers where the light is guided due to the total internal reflection in a single mode optical fiber are instead called fiber lasers. Guiding of light allows extremely long gain regions providing good cooling conditions; fibers have high surface area to volume ratio which allows efficient cooling. In addition, the fiber's wave guiding properties tend to reduce thermal distortion of the beam. Erbium and ytterbium ions are common active species in such lasers.

Quite often, the fiber laser is designed as a double-clad fiber. This type of fiber consists of a fiber core, an inner cladding and an outer cladding. The index of the three concentric layers is chosen so that the fiber core acts as a single-mode fiber for the laser emission while the outer cladding acts as a highly multimode core for the pump laser. This lets the pump propagate a large

amount of power into and through the active inner core region, while still having a high numerical aperture (NA) to have easy launching conditions.

Pump light can be used more efficiently by creating a fiber disk laser, or a stack of such lasers. Fiber lasers have a fundamental limit in that the intensity of the light in the fiber cannot be so high that optical nonlinearities induced by the local electric field strength can become dominant and prevent laser operation and/or lead to the material destruction of the fiber. This effect is called photo darkening. In bulk laser materials, the cooling is not so efficient, and it is difficult to separate the effects of photo darkening from the thermal effects, but the experiments in fibers show that the photo darkening can be attributed to the formation of long-living color centers. Figure (2.5) shows the fiber lasers.

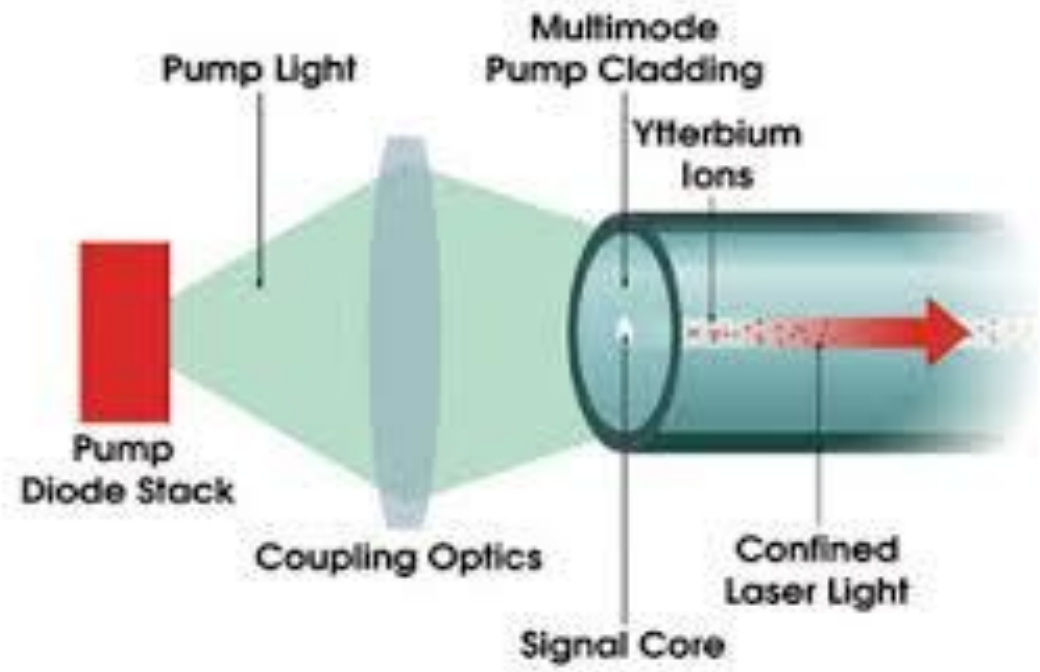
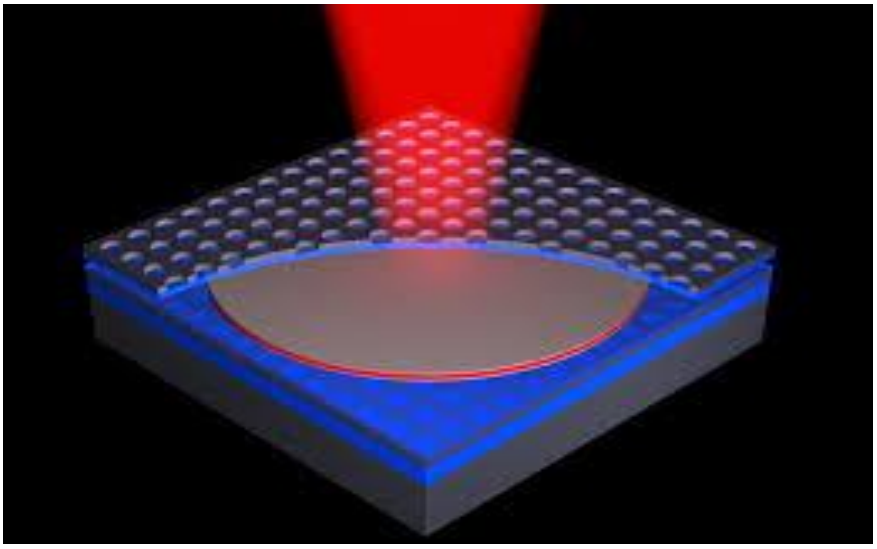


Figure 2.5 Fiber lasers

2.3.6 Photonic crystal lasers

Photonic crystal lasers are lasers based on nano-structures that provide the mode confinement and the Density of Optical States (DOS) structure required for the feedback to take place.] They are typical micrometer-sized and tunable on the bands of the photonic crystals. Figure (2.6) shows the photonic crystal lasers.



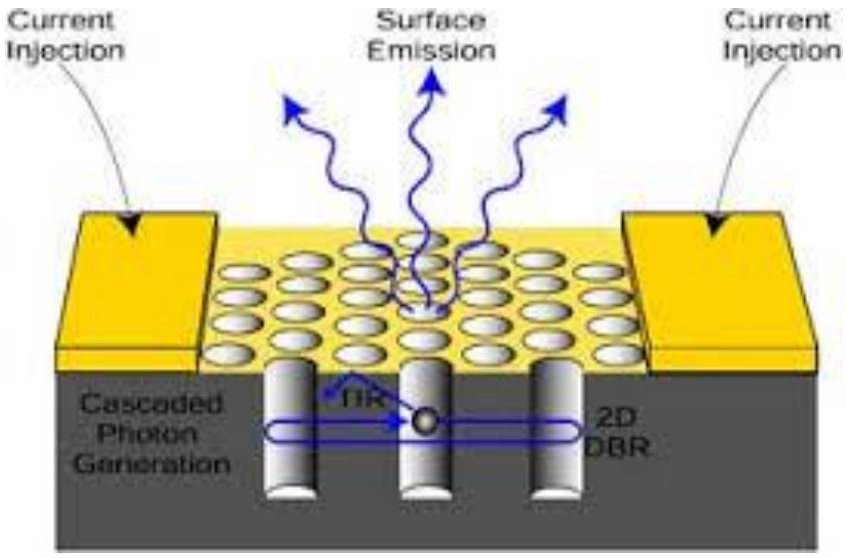


Figure 2.6: Photonic crystal lasers

2.3.7 Semiconductor lasers

A 5.6 mm 'closed can' commercial laser diode, probably from a CD or DVD player. Semiconductor lasers are diodes which are electrically pumped. Recombination of electrons and holes created by the applied current introduces optical gain. Reflection from the ends of the crystal form an optical resonator, although the resonator can be external to the semiconductor in some designs.

Commercial laser diodes emit at wavelengths from 375 nm to 3500 nm. Low to medium power laser diodes are used in laser pointers, laser printers and CD/DVD players. Laser diodes are also frequently used to optically pump other lasers with high efficiency. The highest power industrial laser diodes, with power up to 10 kW (70 dBm) are used in industry for cutting and welding. External-cavity semiconductor lasers have a semiconductor active medium in a larger cavity. These devices can generate high power outputs with good beam quality, wavelength-tunable narrow-line width radiation, or ultra short laser pulses. Figure (2.7) shows the semiconductor lasers.

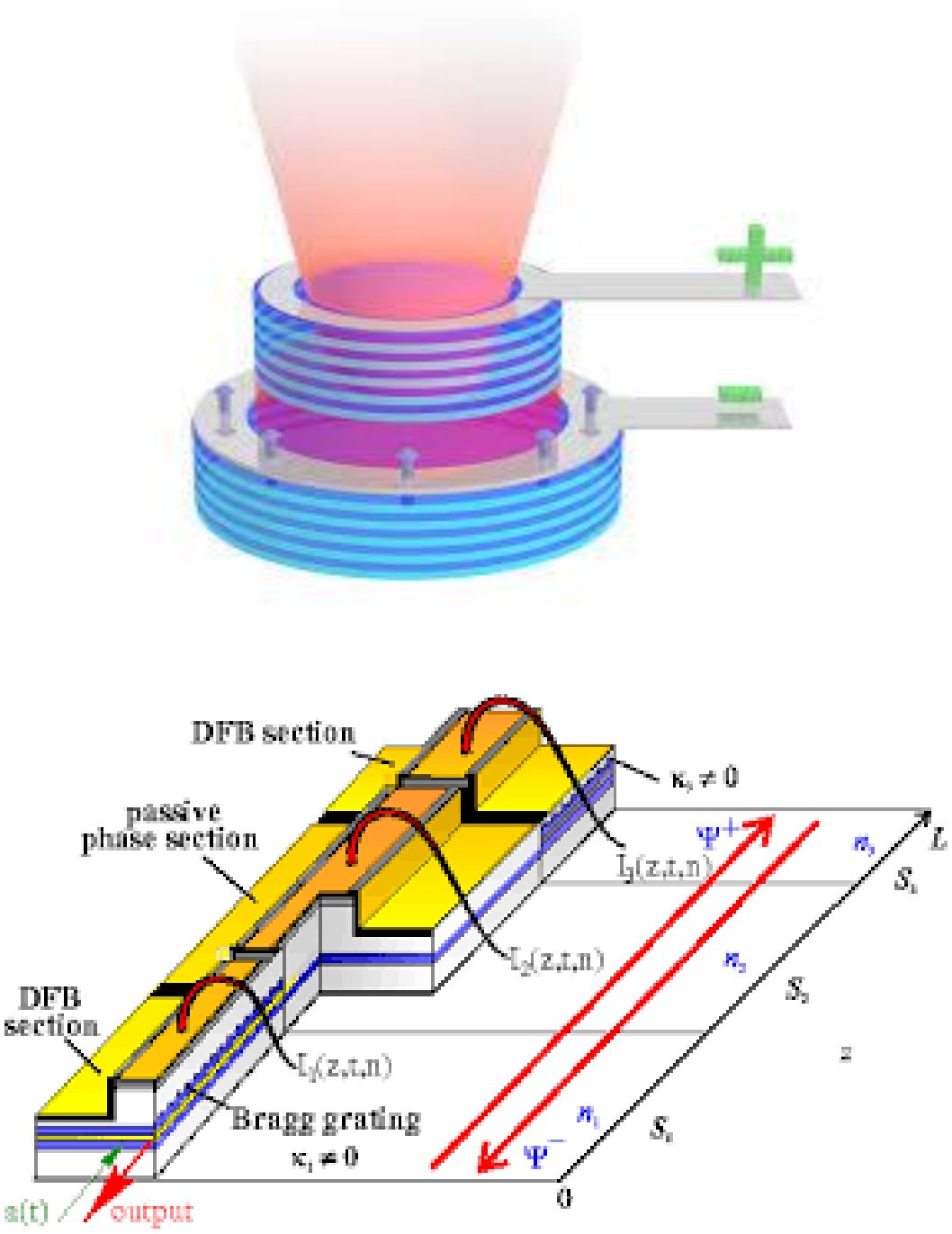


Figure 2.7: Semiconductor lasers

2.3.8 Dye lasers

use an organic dye as the gain medium. The wide gain spectrum of available dyes, or mixtures of dyes, allows these lasers to be highly tunable, or to produce very short-duration pulses (on the order of a few femto seconds).

Although these tunable lasers are mainly known in their liquid form, researchers have also demonstrated narrow-linewidth tunable emission in dispersive oscillator configurations incorporating solid-state dye gain media. In their most prevalent form these solid state dye lasers use dye-doped polymers as laser media. Figure (2.8) shows the dye lasers.

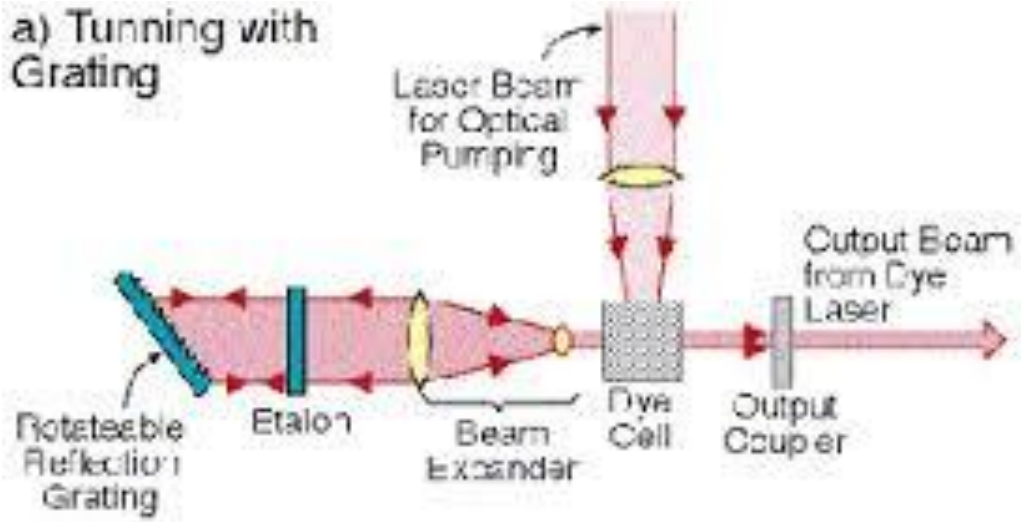


Figure 2.8: Dye lasers

2.3.9 Free-electron lasers

Free-electron lasers, or FELs, generate coherent, high power radiation that is widely tunable, currently ranging in wavelength from microwaves through terahertz radiation and infrared to the visible spectrum, to soft X-rays. They have the widest frequency range of any laser type. While FEL beams share the same optical traits as other lasers, such as coherent radiation, FEL operation is quite different. Unlike gas, liquid, or solid-state lasers, which rely on bound atomic or molecular states, FELs use a relativistic electron beam as the lasing medium, hence the term free-electron. Figure (2.9) shows the free-electron lasers.

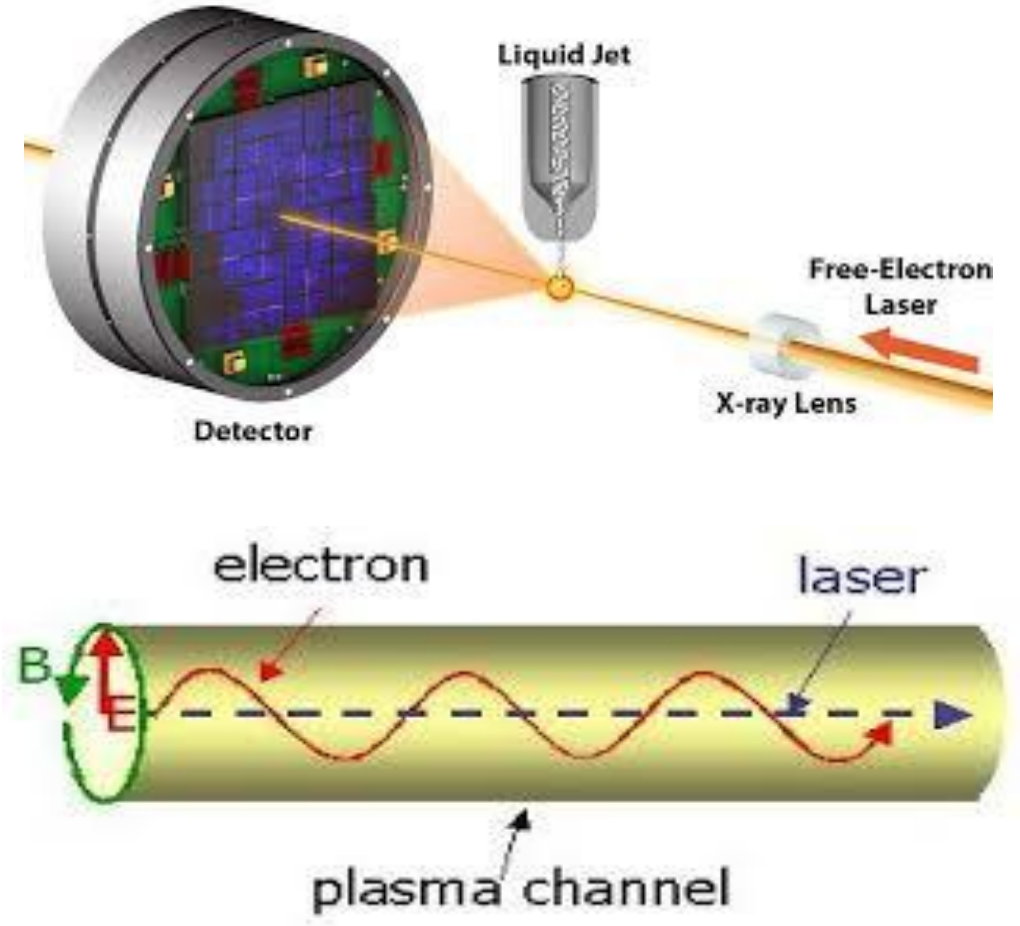


Figure 2.9: Free-electron lasers

2.4 Theories of Laser

Laser can cover many theories such as:

- Theories on the nature of light:

The first scientist who put forward a plausible theory about light was Newton. This theory is known as "corpuscular theory of light". Concurrently, the 'Wave Theory of light' was postulated by Huygens. As explained below each of these theories failed to explain certain phenomena associated with light.

- Corpuscular theory of light**:**

According to this theory, a luminous body emits continuous steams of invisible particles of matter, in all directions. These particles travel in straight lines with high, but definite, velocities through a homogenous medium and they carry their kinetic energy with them. These particles create the sensation of light, when they reach the retina of the eye.

- Wave theory of light**:**

It was presented by Christian Huygens exactly at the same time, when corpuscular theory was presented.

According to the wave theory of light as postulated by this Dutch Astronomer and physicist, 'light travels from a point (Say A) to another point (Say B) in the form of waves'. These waves travel through a medium called 'Ethereal Medium' or simply, 'Ether'. The light waves are similar to the waves that we observe on the surface of a calm lake, when a stone is thrown into it. The ethereal medium is considered to be a very stable, weightless and highly elastic one, at the same time, having the power to permeate almost all types of matter. {1,2}

CHAPTER THREE

WIRLESS COMMUNICATION

CHAPTER THREE

WIRELESS SYSTEM

3.1 Introduction

A wireless communications is one of the big engineering success stories of the last 25years –not only from a scientific point of the view .where the progress has been phenomenal but also in terms of market size and impact on society. For a long time, wireless communication has been ass ociation with cellular telephony as this is the biggest market segment and has had the highest impact on everyday lives .in recent times of workers-answering emails in a coffee shop has become as everyday occurrence. Wireless sensor networks monitor factories, wireless links replace the cables between computers and keyboards, wireless positioning system monitor the location of trucks that have goods identified by wireless Radio Frequency (RF) tags.

Wireless communication is actually the oldest form- shouts and jungle drums did not require any wires or cables to function .even the oldest 'electromagnetic' (optical) communications are wireless signals are based on propagation of optical signals a line –of-sight connection. However, wireless communications as we know it started only with the work of Maxwell and hertz .who laid the basis for our under –standing of the transmission of electromagnetic waves .it wasn't long fter their ground breaking work that tesla demonstrated of information via this waves –inessnce the first wireless communication system .in 1898 Marconi made his well publicized demonstration of wireless communications. In the subsequent years the use of radio became wide spread throughout the world.

3.3 Type of Services

The first wireless service was broadcast radio .in this application information is transmitted to different, possibly mobile users. The properties broadcast radio are:

I- The information is only sent in one direction.

II- The transmitted information is the same for all users

III- The information is transmitted continuously.

IV- In many cases multiple transmitters send the same information.

Similar to broadcast, paging systems are unidirectional wireless communication systems. They are characterized by the following properties.

I- The user can only receive information, but cannot transmit.

II- The information is intended for, and received by, only a single user.

III- The amount of transmitted information is very small.

Cellular telephony is the economically most important form of wireless communication .it is characterized by the following properties:

I- the information flow is bidirectional .a user can transmit and receive

Information at the same time

II- the user can be anywhere within a(nationwide or international) network. Neither nor the calling part y need to know the users location; it’s the network that has to take the mobility of the user into account.

III- A call can originate from either the network or the user .in other word a cellular customer can be called or can initiate a call.

IV- A call is intended only for a single user; others users of the network should not be able to listen in

V- high mobility of the users' .the location of a user can change significantly during a call.

Tracking radio system are an important variant of cellular phone, where there is no connection between the wireless system and the PSTN; therefore, is allow the communication of closed user group.

The closed user group allows implementation if several technical innovation that are not possible in normal cellular system:

- a communication can be sent to several users simultaneously, or several users can setup a conference call between multiple users of the systems.

- a normal cellular system operates on a "first-come, first-serve" basis. Once a call is established, it cannot be interrupted.

- the range of the network can be extended by using each Mobile Section (MS) as a relay section for other MSs.

- Cordless telephony describes a wireless link between handset and a Bs that is directly connected to the public telephone system. The man difference from a cell phone is that the Cordless telephone is associated with, only a single Bs. This has several important consequences:

The Bs does not need to have any network functionality. When a call is coming is from the PSTN, there is no need to find out the location of the MS.

There is no central system.

The fact that the cordless phone is under the control of the user also implies a different pricing structure: there are no network operates that can charge fees

for connections from the MS to the BS; rather, the only occurring fees are the fees from the BS in to the PSTN.

Wireless local area network: The functionality of wireless area networks (WLANs) is very similar to that of cordless phones- connecting a single mobile user device to a public landline system.

A major different between wireless LANs and cordless phones is is the required data rate.

Personal Area Networks: When the coverage area becomes even smaller than that of WLANs, we speak of Personal Area Network. Such networks are mostly intended for simple "cable replacement" duties. For example, devices following the Bluetooth standard allow to connect a hands- free headset to a phone without requiring a cable; in that case, the distance between the two devices is less than ammeter.

Networks for even smaller distances are called Body Area Networks (BANs) , which enable communication between devices located on various part of a user's body . Such (BANs) play an increasingly important role in the monitoring of patients health and of medical devices.

We note finally that PANs and BANs can either have a network structure similar to a cellular approach.

Fixed Wireless Access: Fixed wireless access system can also be considered as a derivative of cordless phones or WLAs,

Essentially replacing a dedicated cable connection between the user and The public landline system.

The main difference from a cordless system is that:

There is no mobility of the user devices.

The BS almost always serves multiple users. Furthermore, the distances bridges by fixed wireless access device are much larger (between 100m and several tens of k.m) than those bridge by cordless telephones.

Satellite cellular communications: The distance between the "BS" (i.e., the satellite) and the MS is much larger: for geostationary satellites, that distance is 36,000 Km for (LEO) satellites, it is several hundred kilometres.

3.4 Requirements for the Services

A key to understanding wireless design is to realize that different application have different requirements in terms of data rate, mobility energy consumption, and so on. It is not necessary to design a system that can sustain gigabit per second data rates over a 100-Km rang when the user is moving at 500Km/h.

We list the range of requirements encountered in system design and we enumerate which requirements occur in which application.

Data Rate: data rate for wireless services span the gamut from a few bits per second to several GB P/s.

Range and number of users: another distinction among the different networks is the range and the number of users that the serve. By range, we mean here the distance between one transmitter and receiver. The coverage area of a system can be made almost independent of the range, by just combining a larger number of BSs in to one big network.

Mobility: wireless system also differs in the amount of mobility that they have to allow for the users. The ability to move around while communicating is one of the main charms of wireless communication of the user.

Energy consumption: is a critical aspect for wireless devices. Most wireless devices use (one-way or rechargeable) batteries, as they should be free of any wires- both the ones used for communication and the ones providing power supply.

Use of spectrum: spectrum can be assigned on an exclusive basis, or on a shared basis. That determine to large degree the multiple access scheme and the interference resistance that the system has to provide; spectrum dedicate to service and operator, spectrum allowing multiple operator, free spectrum, UWB.

3.4 Economic and Social aspects

Economic Requirements for Building Wireless communication System: The design of wireless system not only aims to optimize performance for specific application but also to do that at a reasonable cost. As economic factor impact the design, scientists and engineer have to have at least a basic understanding of the constraints imposed by marketing and sales divisions.

The Market for Wireless Communication: Cell phones are a highly dynamic market that has grown tremendously. Still, different countries show different market penetration. Some of the factors influencing this penetration are; price of offer services, attractiveness of the offered services price of the MSs, general economic situation, existing telecom infrastructure software suppliers, system integrator.

{3}

CHAPTER FOUR

PRACTICAL APPLICATION

CHAPTER FOUR

PRACTICAL RESLUTS

4.1 Introduction

This practical application covers a industrial protection, factory that is far from urban areas that needs a security system to save the factory from robbery, fires...etc

4.2 System Operation

The security system consist with many circuits such as**:**

- Main circuit (laser circuit)

The main circuit consists of alight dependent resistor ,a transistor type of (2n3906) and relay (5v),has a five points tow of then for the operation coil, common point (N-O) normal open point ,and normal close point (N-C) ,after that we use a reflecting mirrors and to make many reflections of laser rays with the (LDR) .in this case the(LDR) resistance will be in the a minimum value allows the positive charges passing to the (2N3906) transistor base ,that its Emitter term conducted to the anode of the battery and the collector term conducted to one of the operation coil points ,and When feeding the base with appositive charge the transistor will be in the forward direction that causing the main relay switching.

when the laser rays has been cut off from the (LDR) it will be in the maximum resisting value that will prevent the positive charge passing to the transistor base that means the transistor working in a reversal direction and the relay operation coil will not be active.

- Latch circuit and remittent conductance:

When something opposes the laser rays that will switch on the relay (NO) when those things pass away the relay will be stopped again.

To solve this problem we added a latch circuit that consists the second relay will make the signal latch, that makes the first relay normal open point to be a signal of switching on the second relay also we added a remittent conductance circuit that consists of a capacitor(16v,1000mf) conducted with a relay (5v) in one of the operation coil points and the normal close(N-C) point with considering the polarity of the capacitor .

The purpose of this circuit is to make a call by the cell phone that conducted with the circuit; because of this we conduct the remittent conductance with the cell phone calling push button.

By this method we can know that if there is a permeation in the factory if we are in anywhere by phone call comes to our cell phone.

- For detecting if there is permeation in the factory when are near place from the factory we added a wireless control circuit that operates with a radio waves (RF) its frequency is(27MHZ) and range (20meters)that consists of tow circuits (sending and receiving).

We will know if there is permeation to the factory when the warning alarm buzzing and the light warning signals lighting that conducted with receiving circuit.

The sending circuit had connected with the main circuit.

4.3 System Components

The security system coverage many components such as:

Laser beam (pointer)

- The typical layout of laser components is show in figure (4.1)

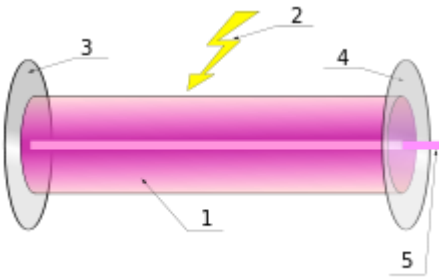


Figure 4.1: Laser components

1. Gain medium
2. Laser pumping energy
3.High reflector
4.Output coupler
5. Laser beam

Wireless pick: radio frequency control (27MHZ) and rang 20m that consists of tow circuits (sending and receiving).

LED lamp: a light-emitting diode (LED) product that is assembled into a lamp (or light bulb) for use in lighting fixtures. LED lamps have a lifespan and electrical efficiency that is several times better than incandescent lamps, and significantly better than most fluorescent lamps, with some chips able to emit more than 100 lumens per watt. The LED lamp market is projected to grow by more than twelve-fold over the next decade, from $2 billion in the beginning of 2014 to $25 billion in 2023, a compound annual growth rate (CAGR) of 25%.

Relay: are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.

Relays are generally used to switch smaller currents in a control circuit and do

not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts.

Protective relays can prevent equipment damage by detecting electrical abnormalities, including over current, undercurrent, overloads and reverse currents. In addition, relays are also widely used to switch starting coils, heating elements, pilot lights and audible alarms.

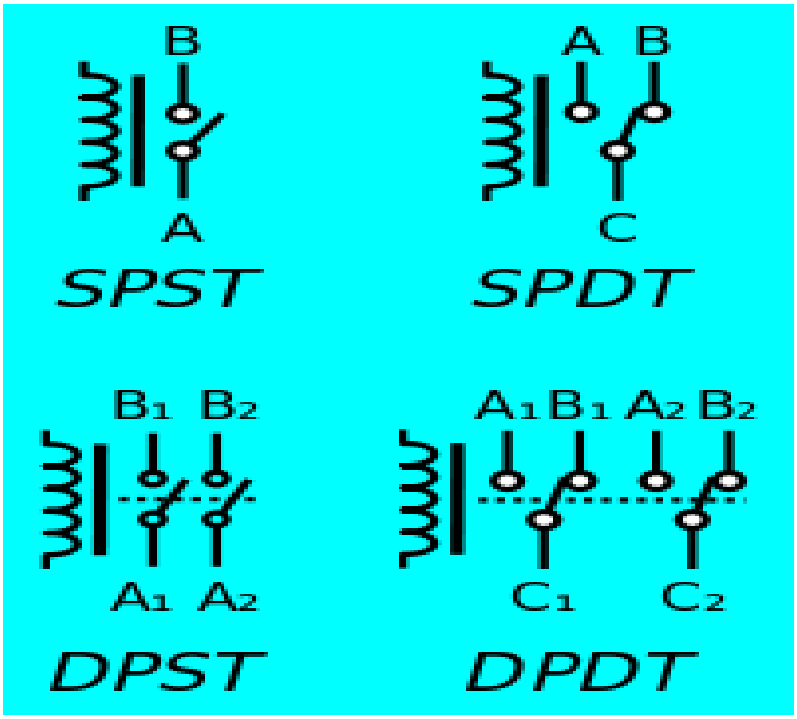


Figure 4.2: Circuit symbols of relays

Buzzer: is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Photoresistor: light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. The resistance of a photoresistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photoresistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.

A photoresistor is made of a high resistance semiconductor. In the dark, a photoresistor can have a resistance as high as several megohms (MΩ), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistors may react substantially differently to photons within certain wavelength bands.

Figure 4.3: Photoresistor

2n2222: The 2N2222 is a common NPN bipolar junction transistor (BJT) used for general purpose low-power amplifying or switching applications. It is designed for low to medium current, low power, medium voltage, and can operate at moderately high speeds. {4}

4.4 circuit diagram:

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

- Laser components can be applied in security system to secure equipments, tools, goods, and industrial marital.

- Laser teachings are accurate in their operation with high speed of response and faithfully enough for control.

5.2 Recommendation

- Controlling factories, industries, home, schools, universities, can be secreted by other method of modern control system.

- can use the higher wireless program to detect if the thing cut off laser pointer is human or no by use temperature human detect.

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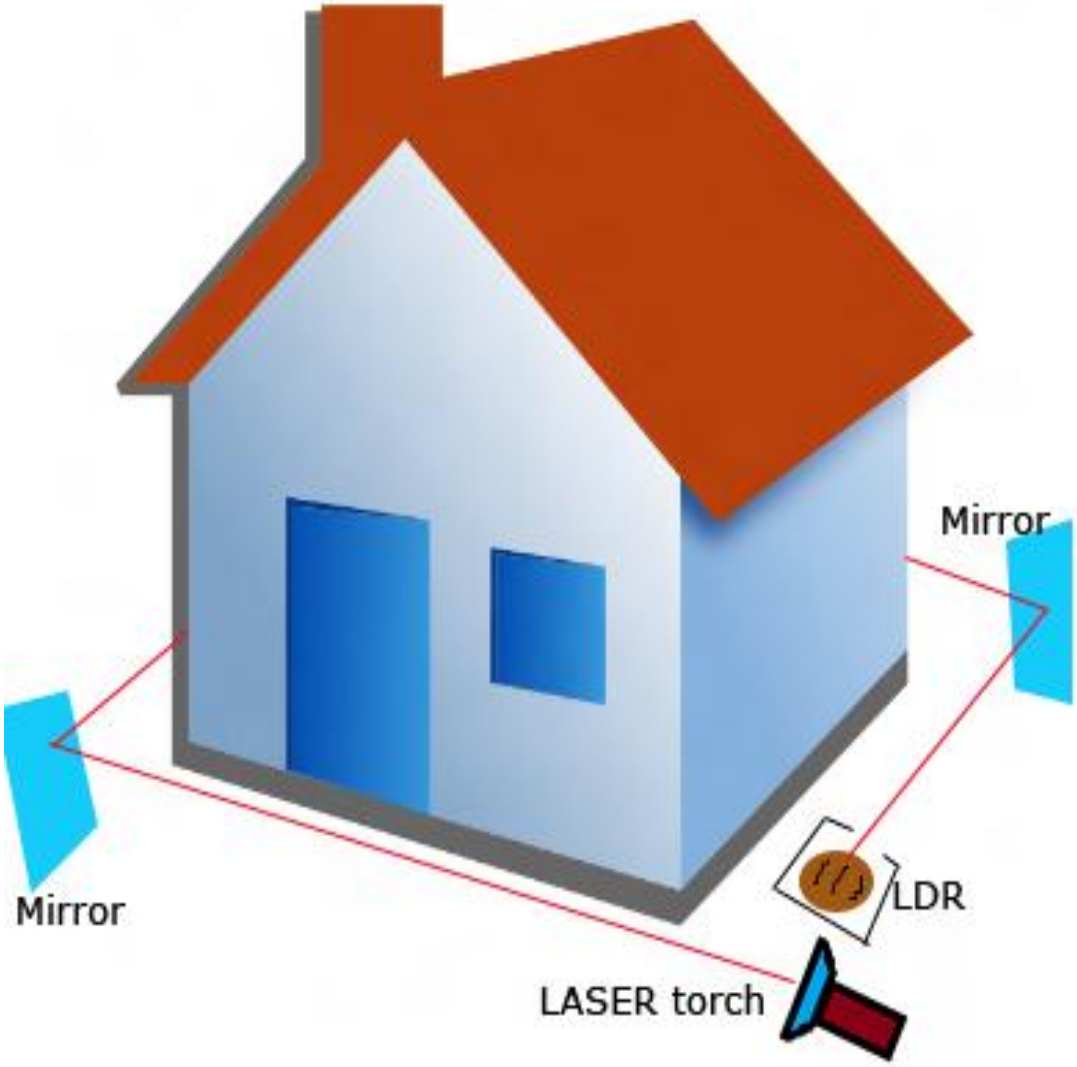
APPENDEX

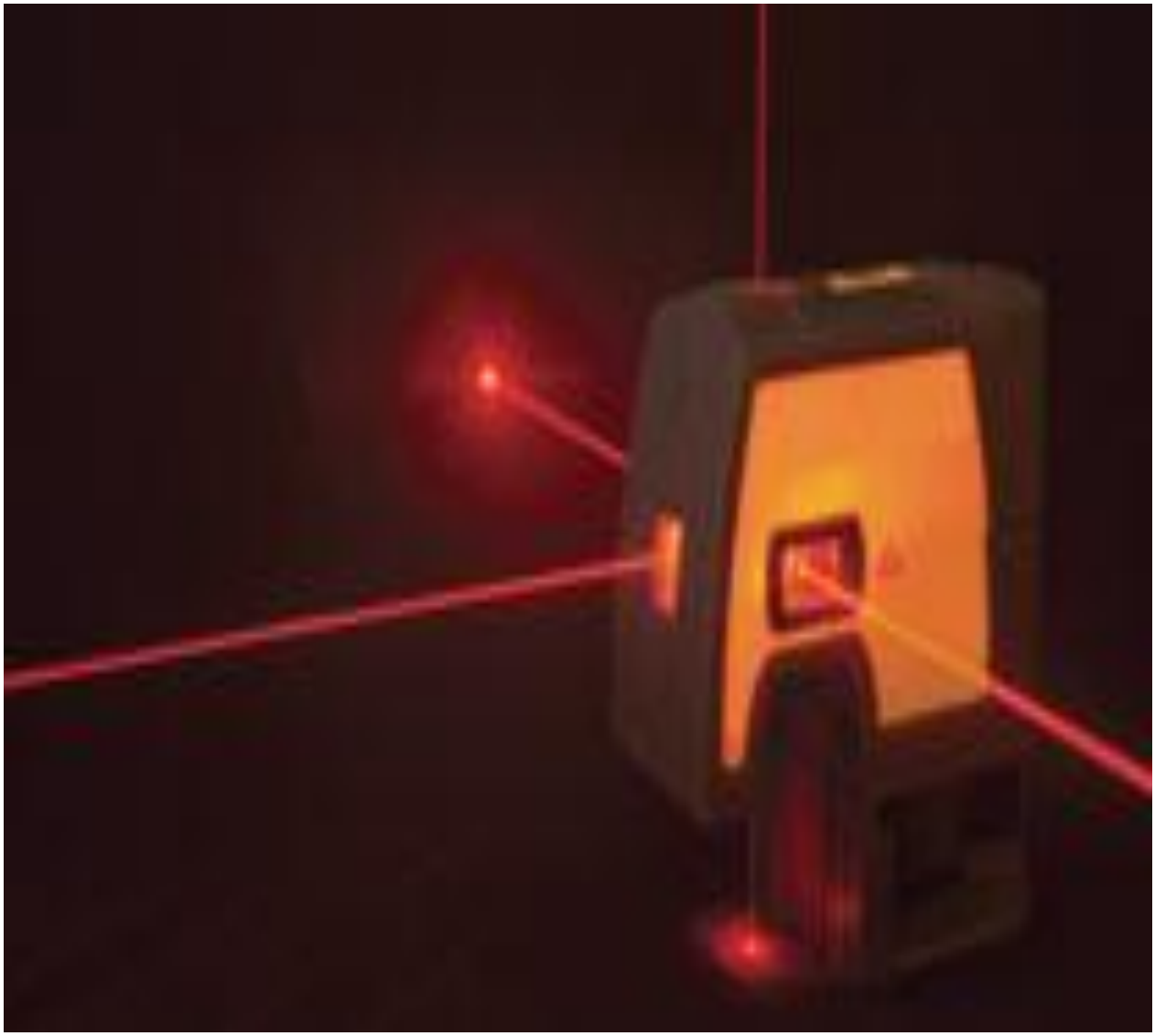
APPENDEX

Home security system



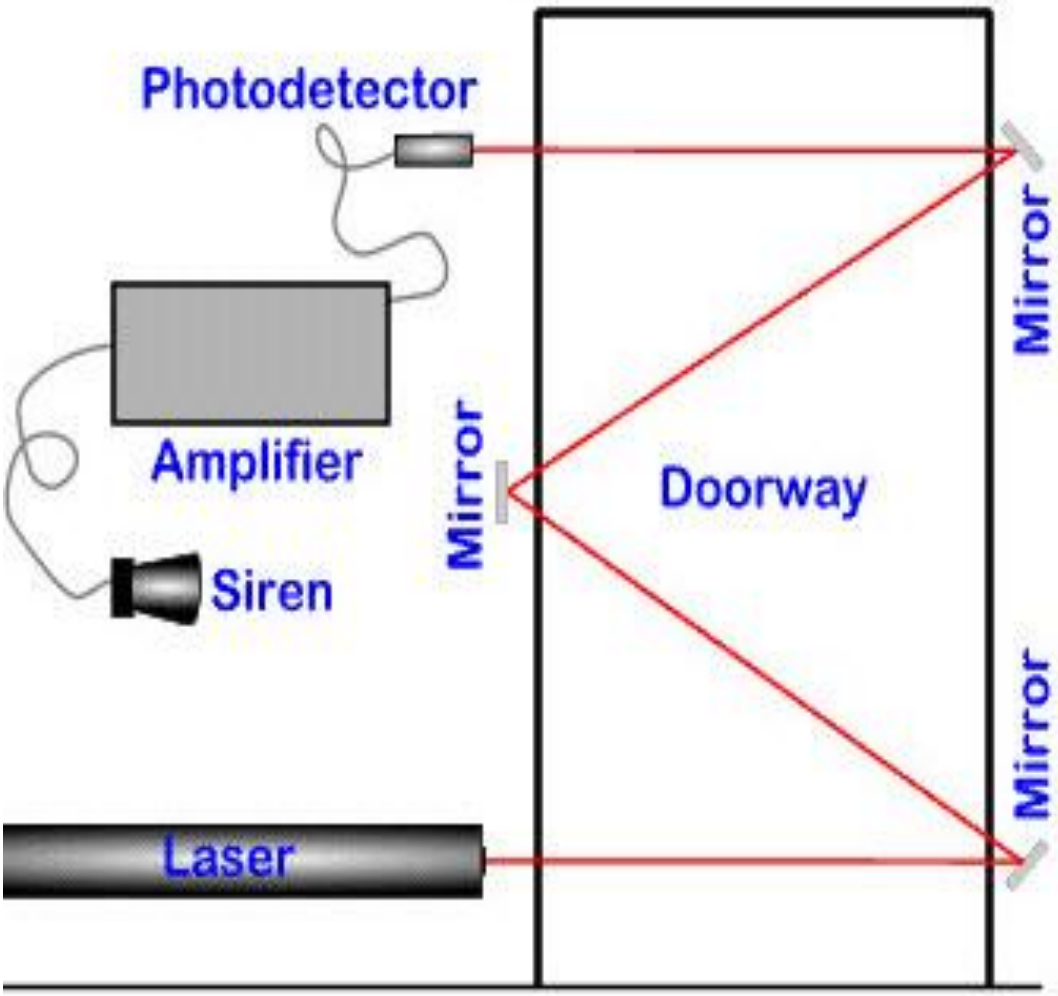
Theft Detection by Laser Sytem

Laser based security system.

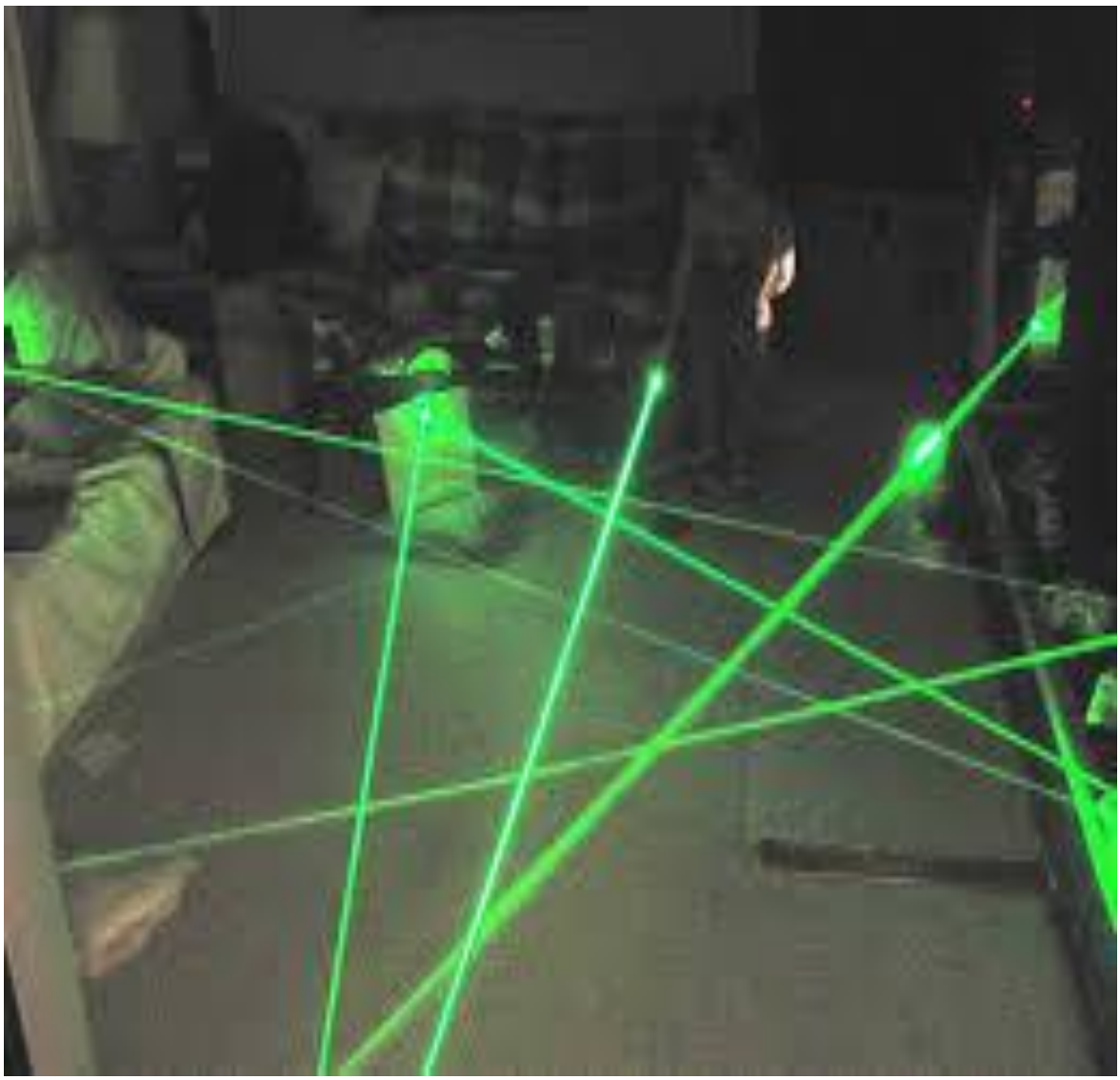


Laser tracking

Laser in industry



Laser security system



Laser pointer