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Communication Department



Design Laser Communication System with Repeater

A project

Submitted to the department of Communication of University of
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Requirements for the Degree of Bachelor in Communication
Engineering.

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1337

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شكر وتقدير

في مثل هذه اللحظات يتوقف اليراع ليفكر قبل أن يخط الحروف ليجمعها في كلمات ... تتبعثر الأحرف وعبثاً أن يحاول تجميعها في سطور.

سطوراً كثيرة تمر في الخيال ولا يبقى لنا في نهاية المطاف إلا قليلاً من الذكريات وصور تجمعنا برفاق كانوا إلى جانبنا فواجب علينا شكرهم ووداعهم ونحن نخطو خطواتنا الأولى في غمار الحياة ونخص بالجزيل الشكر والعرفان إلى كل من أشعل شمعة في دروب عملنا و وإلى من وقف على المنابر وأعطى من حصيلة فكره لينير دربنا إلى اساتذتنا الكرام ونتوجه بالشكر الجزيل إلى الدكتورة سهى ابراهيم النصار التي تفضلت بالإشراف على هذا البحث فجزاها الله عنا كل خير فلها منا كل التقدير والاحترام ونوجه الجزيل من الشكر والامتنان الى د. صائب ذياب و أستاذ حسين أحمد على كل ماقدمهما لنا من المساعدات والتوجيهات السديدة.

الاهداء

إلهي لا يطيب الليل إلا بشرك ولا يطيب النهار إلا بطاعتك ... ولا تطيب
اللحظات إلا بذكرك ... ولا تطيب الآخرة إلا بعفوك ... ولا تطيب الجنة إلا
برؤيتك...

****الله جل جلاله****

إلى من بلغ الرسالة وأدى الأمانة .. ونصح الأمة .. إلى نبي الرحمة ونور
العالمين ...

****سيدنا محمد صلى الله عليه وسلم****

إلى من كلله الله بالهبة والوقار .. إلى من علمني العطاء بدون انتظار .. إلى
من أحمل أسمه بكل افتخار .. أرجو من الله أن يمد في عمرك لترى ثماراً قد
حان قطافها بعد طول انتظار وستبقى كلماتك نجوم أهدي بها اليوم وفي الغد
والى الابد...

****والدي العزيز****

إلى ملاكي في الحياة .. إلى معنى الحب وإلى معنى الحنان والتفاني .. إلى
بسمة الحياة وسر الوجود
إلى من كان دعائها سر نجاحي وحنانها بلسم جراحي إلى أغلى الحبايب...

****أمي الحبيبة****

إلى من آتسني في دراستي وشاركني همومي تذكراً وتقديراً

****أصدقائي****

إلى الذين كانوا عوناً لنا في بحثنا هذا ونورا يضيء الظلمة التي كانت تقف
أحياناً في طريقنا.
إلى من زرعوا التفاؤل في دربنا وقدموا لنا المساعدات والتسهيلات والأفكار
والمعلومات

****اساتذتنا الكرام****

ABSTRACT

Communication is the most important activity of human being. Different modes of communication are used, and voice communication is one of those categories. From the beginning of technological advancement, many processes have been used for the voice communication purpose.

Laser Voice Transmission Process is much more useful because of wireless connectivity and free from disadvantage of radio frequency transmission, which work similarly to fiber optic links, except the beam is transmitted through free space.

This project includes analysis, optimization and system level development of signal transformation between any two sources. Two parallel beams are needed, one for transmission and one for reception. The carrier used for the transmission signal is typically generated by a laser diode. Sound signals were transported from one point to another by imposing them on green or red light, in other words by using modulation process.

Also this project deals with the Design and construct an optoelectronic repeater to be utilized to extend the range of a laser free- space communication system. It consist of an optical receiver, an electronic processing unit, and an optical transmitter. This repeater is expected to extend the range of the laser communication system several depending on the number of the utilized repeater.

Contents

Chapter One: Introduction

1-1 Introduction.....	1
1-2 Problem Statement	2
1-3 Objectives	2

Chapter Two: Literature Review

2-1 Introduction.....	4
2-2 Literature Review.....	4
2-3 Laser Communication system	5
2-4 Importance of Laser Communication system.....	7
2-5 Advantage of laser communication system.....	8
2-6 Compares between laser and others types.....	9
2-7 Application of laser communication system.....	9

Chapter Three: Methodology

3-1 Introduction	11
3-2 Methodology	11
3-2-1 Circuit Diagram –Transmitter.....	13
3-2-2 Circuit Diagram – Receiver.....	14
3-2-3 Circuit Diagram – Repeater.....	16
3-3 Design and Working of the System	17

Chapter Four: Results and Discussion

4-1 Introduction	18
4-2 Transmitter Circuit	18
4-3 Receiver Circuit	19
4-4 Repeater circuit	20
4-5 Design and Working of the System.....	21

Chapter Five: Conclusions and Future works

5-1 Introduction.....	22
5-2 Conclusion.....	22
5-3 Future Works	22
References	23

LIST OF TABLES

TABLE NO.	TITLE	PAGE
3.1	The important components for transmitter circuit	14
3.2	The important components for receiver circuit	15
3.3	The important components for repeater circuit	17

LIST OF FIGURE

FIGURE NO.	TITLE	PAGE
2.1	Schematic diagram for laser communication system with Optical repeater	6
3.1	Block diagram of laser communication system with repeater	8
3.2	The transmitter circuit	13
3.3	Receiver circuit	14
3.4	Repeater circuit	16
4.1	Transmitter circuit	19
4.2	Receiver circuit	19
4.3	Repeater circuit	20
4.4	Design and working the laser communication system with Repeater	21

LIST OF ABBREVIATIONS

AGC – Fade Mitigation Techniques

Chapter One

Introduction

1-1 Introduction:

The necessity of communication through distance was grown to pass information from one place to another by different ways like telephone, radio, televisions, cell phone, computer and Internet[1].

From the beginning of technological advancement, many processes have been used for the voice communication purpose and laser communication system is much more useful for voice communication because of wireless connectivity and free from disadvantage of radio frequency transmission. Thus laser communication is one of the key area in wireless Communications system. Currently laser commutation is adopted in satellite communication for space research activities and due to its efficiency on low noise ratio, inexpensive , low power and its flexibility and its resistance to the radio interferences makes laser communication as one of research area in wireless communication[1,2].

Laser communications systems work similarly to fiber optic links, except the beam is transmitted through free space (through the atmosphere). The carrier used for the transmission signal is typically generated by laser diode. The intensity of the carrier beam changes with the change in amplitude of the sound signal. Variation in the intensity of the laser beam is converted into a variation in the voltage level by using solar [1].

Any Communication system consists of three main units, a transmitter, propagation medium and receiver. It can be used to transmit sound and data signals through the laser beam of the system. This system has many benefits such as , the range between the information source and its destination in addition to the cost and many other factors dictate the power requirements of the communication system. Optical communication system have many promising advantages that make them the proper choice to many applications. Laser source added powerful tool to optical communication system which

increases their capability especially in free space communications including the remote sensing as a type of indirect or passive communications.[3]

Free – space, or unguided optical communication system have many important applications, specially, when one or both terminals (transmitter – receiver) has to be mobile is found very interesting in modern military applications since it provides a highly secured communication channels [3].

This project includes analysis, optimization, design and system level development of signal transformation between any two sources.

This project is not expensive and can be made with the equipments available here including signal repeaters that consisted of a detector, amplifier, and a signal regenerator that restored the shape and intensity of the pulse and laser source replicates and reinforces the signal optically [3].

This project includes the use of repeater which works to amplify the signal that will be received from the transmitter circuit through the detector works on amplified and then carry by Laser and be received in the form of voice and benefit from the use of repeater here are amplified signal to Instead them in the signal transduction process distances farther than means he can received signal but distant spaces .

1-2 Problem statement:

The main problem that we faced is the choice of a suitable laser is compatible with the components in this project.

1-3 Objectives:

- The main aim of this project is to construct a Laser communication system with repeater using low cost laser torch and available electronic equipment.

- To implement light based voice transmission and reception system by using light from a laser torch as the carrier of the signal.
- To design and implement a new circuit with the substitution of photo transistor (LDR) available at local electronics market)
- Using this circuit to communicate with the neighbor place wirelessly.

Chapter Two

Literature Review

2-1 Introduction:

Any Communication system consists of three main units, a transmitter, propagation medium and receiver. The purpose of the system, the range between the information source and its destination in addition to the cost and many other factors dictate the power requirements of the communication system. Optical communication system have many promising advantages that make them the proper choice to many applications. Laser source added powerful tool to optical communication system which increases their capability especially in free space communications including the remote sensing as a type of indirect or passive communications.

Free – space, or unguided optical communication system have many important applications, specially, when one or both terminals (transmitter – receiver) has to be mobile is found very interesting in modern military applications since it provides a highly secured communication channels [3].

2-2 Literature Review:

Before 5000 years the Egyptians invented Optical communications by transmitting signal using glass and the Troy fall was transmitted in VI BC by the Greeks through torches [4]. All Modern day optical fiber communication is based on ancient system. The functioning Laser was first operated by Theodore H. Maiman in May 16, 1960 [5] and first visible light laser diode was demonstrated by Nick Holonyak in almost 1960 [6] and latter it was improved by several scientist of the world including USA at IBM, MIT Lincoln Laboratory, Texas in 1962 [7]. Laser diode is suitable for using in optical communication as it is monochromatic (coherent) light source and easy modulates [8]. Low attenuation optical fiber invented by Kapron in 1970 can be used for communication through Laser in which some amount of power is lost at least [4]. some projects of laser torch based voice transmission system was constructed with Laser torch(up to wave length of 920nm), IC 741 as volume

controller, BC 548, BD 139 as electrical signal amplifiers, Condenser (electrostatic microphone) in transmitter and IC 741, IC 386, with 2n5777 Photo Transistor and 0.5w/8 Ω Speaker in receiver [9]. Robert T. Sparks, Stephen M. Pompea and Constance E. Walker have made one system to transmit music or voice over 350 feet by using laser for class room use in schools. An Idea of wireless voice transmission has been given by Thiyagarajan. K, college of Engineering, Chennai, India, which can be a substitution of optical fiber communication system. In his circuit, he has used resistors of 100R, 1K, 10K, 22K, 100K, 220K, 680K, 1M and 100K Koa trim-pot, Capacitors (10 and 2100 μ F electrolytic and 10.1 μ F monoblock), microphone, transistors, Laser source and photo transistor as a sensing element [10]. Another circuit of Laser Torch-Based Voice transmission system has been collected from circuit idea by Pradeep. G which contents condenser micro phone, transistor amplifier BC 548, an op-amplifier 741 μ A, 1M Ω variable resistor, Base transistor BD139, a 3V Laser torch, 9V power supply etc. in transmitter circuit and an NPN phototransistor as light sensor, two stage amplifier and audio amplifier in receiver circuit [11]. In 2009 Rayed N. Ali et.al design Optical Repeater for free- space laser communication System[3] .

2-3 Laser Communication System with Repeater :

Laser communication is a wireless communication system which is economic, reliable and can replace costly optical fiber communication and radio signal. The youngest form of communication can be transmitted data with less interference and crystal clarity with the help of Laser [10,12].

Laser communications systems are wireless connection through the atmosphere. Which is focused on decreasing the noise ratio in optical communication system. Laser communication system can be used to transmit sound and data signals through the laser beam of the system. The intensity of the carrier beam changes with the change in amplitude of the sound signal. By using solar panel

the intensity of variation laser beam is converted into a variation in the voltage level.

Thus Laser Communication need two parallel beams, one for transmission and one for reception. The transmitter and receiver must require a line-of-sight conditions and Laser communications systems have the benefit of eliminating the need for broadcast rights and buried cables. Laser communications systems can be easily deployed since they are inexpensive, small, low power and do not require any radio interference studies. The carrier used for the transmission signal is typically generated by a laser diode[1].

Laser communications plays a key role, as a solutions for satisfy ever increasing high demand of bandwidth. It supports possible transmit speeds of up to a gigabit per second.

In this mode of communication the transmitter and receiver requires to satisfy the line of sight conditions. The carrier required for transmission of signal in laser communication system is generated by laser diodes. Fig. (2.1) shows the schematic diagram of laser communication system with repeater[1,3,13].

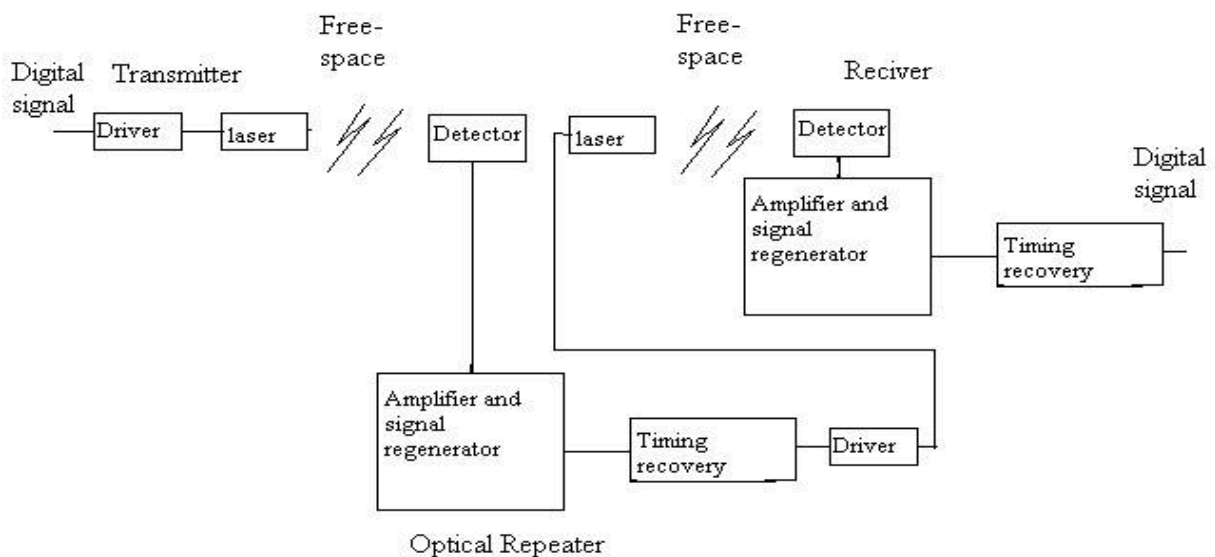


Fig. (2.1): Schematic diagram for laser communication system with Optical repeater

In the case of free space optical communication, the range between the transmitter and receiver is limited by the direct viewing within a line of signal, and for a high – capacity digital system, then repeaters are used to extend the range of the overall system. Repeaters usually designed with the same optical components as the terminal equipment, That is it consists of a detector, low noise, an amplifier and automatic gain control gain, threshold detection and regeneration, and a laser transmitter circuitry. The attenuate and dispersed optical pulse train is detected and amplified in the receive unit. This consists of a acquired is given a further increase in power level in a main amplifier prior to reshaping in order to order to compensate for the transfer characteristic of propagation medium and the amplifier using an equalizer. Depending on the photodiode utilized, automatic gain control (AGC) may be provided at this stage for both the photodiode bias current and the main amplifier. Accurate timing (Clock) information is then obtained from the amplified and equalized waveform using a timing extraction circuit such as a reining circuit on phase locked loop. This enables within he bit intervals of the original pulse train. This function of the repeater circuit is to reconstitute the originally transmitted pulse train, ideally without error[3].

2-4 Importance of Laser Communication system

In Laser communication system vast data can be transmitted with less interference and crystal clarity with the help of Laser, the youngest form of communication [9]. Different kinds of Laser based transmission system has been implemented for different purposes by using various electronic equipments[1].

This project is not expensive for middleclass people and can be made with the equipments available here and can be used for general conversion purpose as well as for confidential data transmission. It can also be used for inter building

communication like in office or in a conference room. It is the cheapest design within the range of lower middle class society. Now a day huge amount of money is spent by the young generation for useless talking over mobile phone to the next door neighbor. The design is so easy, inexpensive and makeable with the available equipments that the technical as well as non-technical person can construct it by themselves for their personal use[13].also in this system using repeater which works to amplify the signal that will be received from the transmitter circuit through the detector works on amplified and then carry by Laser and be received in the form of voice and benefit from the use of repeater here are amplified signal to Instead them in the signal transduction process distances farther than means he can received signal but distant spaces [3].

2-5 Advantages of Laser Communication System:

The advantages of laser communication can be summarized in these points[1]:

- It allows very fast communication service between two or more devices than other modes of communications. it can provide speed more than 1GBps.So it overtakes the LAN or wireless LAN comprehensively.
- Laser communications systems are inexpensive, small, low power and do not require any radio interference studies. The carrier used for the transmission signal is typically generated by a laser diode.
- The transmitting and receiving station are smaller and lighter for given range.
- Higher data rate may be achieved for given distance and power output.
- Signals can be reproduced without distortion, even long distances.
- A one way laser communications system that is capable of the transmission of both text and sound.
- The design of Laser voice transmission system can be made at home with minimum cost and can be used for frequent conversation between neighboring house at free of cost instead of using cell phone.

2-6 Comparasim Between communication by Laser and others

Types:

Laser communication (LC) being the best method than other types[1,13].

Property	Description
Bandwidth	Laser Communication (LC) is 100 times greater than for other types
power	in LC is directed at target, so much less transmission power required. Also the power loss is less.
Size / Weight	LC antenna is much smaller than other types.
Security	Due to low divergence of laser beam, LC is more secure than other types.

2-7 Application of Laser Communication System:

Application of laser is in the field of communications, which takes advantage of its wide bandwidth and narrow beam width over long distances and with the powerful laser, it would even be possible to communicate using satellites to reflect the signals The laser beams can be created in a range of wavelengths from the ultraviolet to the infrared regions of the electromagnetic spectrum.A particular aspect of laser transmission, which makes it preferable to the ordinary radio waves for military purposes is the strict secrecy provided by the narrow beam width.The optical laser has a great potential for use in long distance communication. Since the capacity of a communication channel is proportional to the frequency band width, at optical frequencies, the information carrying capacity is many times more than that is possible at lower frequencies. This and the fact that the laser is a generator of highly coherent beams which are powerful and sharply directed, make it ideally suited for communications.For communication purposes, the laser beam is modulated by the signal. At the receiving station, the modulated beam is demodulated (detected) to separate the required signal from the laser beam (carrier). The output current, which varies

with the intensity of the signal, is amplified and then fed to the speaker. Laser communication through open atmosphere is possible only when there is line of sight between the transmitter and the receiver and that too in good weather conditions. To circumvent these difficulties, laser communication through the medium of optical fiber has been achieved in recent years[1,13].

Chapter Three

Methodology

3-1 Introduction:

This chapter will be clarify the necessary steps to set up the laser communications system for the transmission the voice using optical repeater. firstly starting from design the transmitter circuit and then design the receiving department as well as the most important department in the project, a signal amplifier circuit by using repeater circuit. also it explains equipments which used for each of the transmitter, receiving and repeater circuits

The design of Laser communications systems in this project can be easily deployed since they are inexpensive, small, low power and do not require any radio interference studies.

In this mode of communication system the transmitter and receiver requires to satisfy the line of sight conditions. The carrier required for transmission of signal in laser communication system is generated by laser diodes.

Also the repeater use to extend the range of a laser free – space communication system. It consists of an optical receiver, an electronic processing unit, and an optical transmitter. This repeater is expected to extend the range of the laser communication system several folds depending on the number of the utilized repeaters.

3-2 Methodology:

For the preparation of this project with a low-cost, there were many graphs that are relevant to the project have been downloaded from various sites schemes. After verification of the selection of appropriate office according to the equipment available in our region and to prepare a low design cost. Where the common people in our country can find equipment available in our local markets at reasonable prices. the designed circuits were constructed on white board. The transmitter and the receiver circuit were tested differently and every

stage output was examined carefully by using an adopter for power supply instead of 12 V battery in the communication department, Faculty of Engineering, University of Diyala .The designing circuits of the transmitter and receiver and Repeater that consisted of a detector, amplifier, and a signal regenerator that restored the shape and intensity of the pulse and laser source replicates and reinforces the signal optically [6], the amplifier detector for reference detector number is (SFH2030), where the detector wavelength match with the wavelength of the laser.

A detector is the preamplifier circuit as well as in the receiving department detector and works wireless. Laser use were available in the market where the wavelength of the laser in uv-visible region and electronic equipment were changed at every stage as needed as well as the availability in the market in order to get correct results and the lowest possible cost. Fig.(3.1) shows the block diagram for the design of laser communication system with repeater

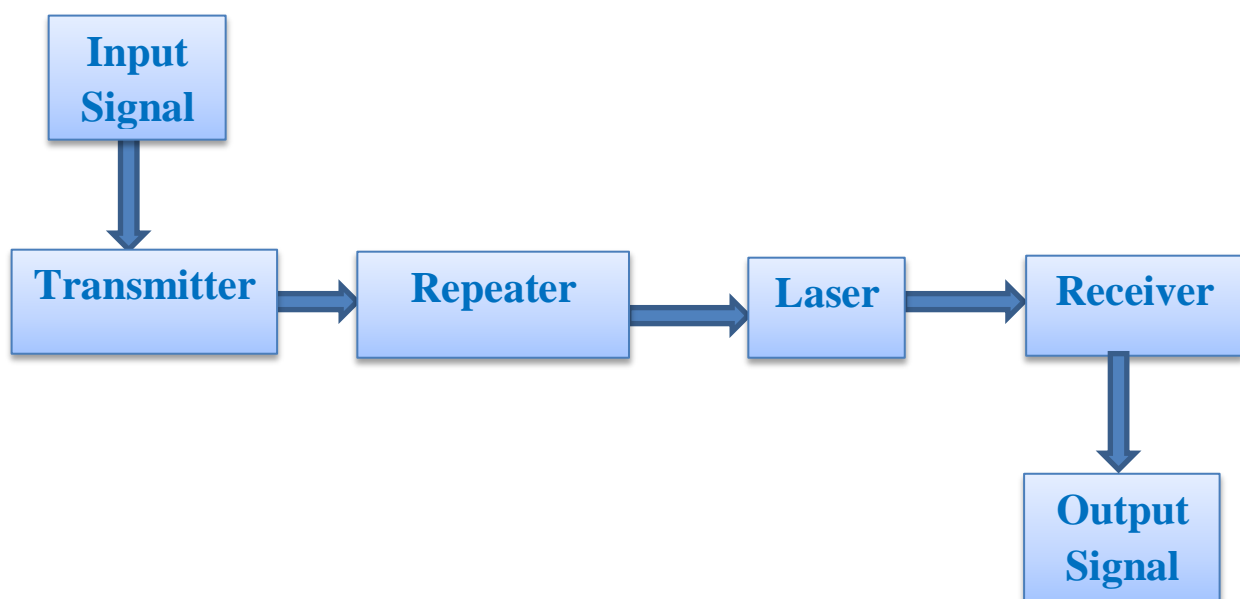


Fig. (3-1) :Block diagram of laser communication system with repeater

3-2-1 Circuit Diagram - Transmitter:

Fig. (3-2) shows the main transmitter circuit which use in this project .

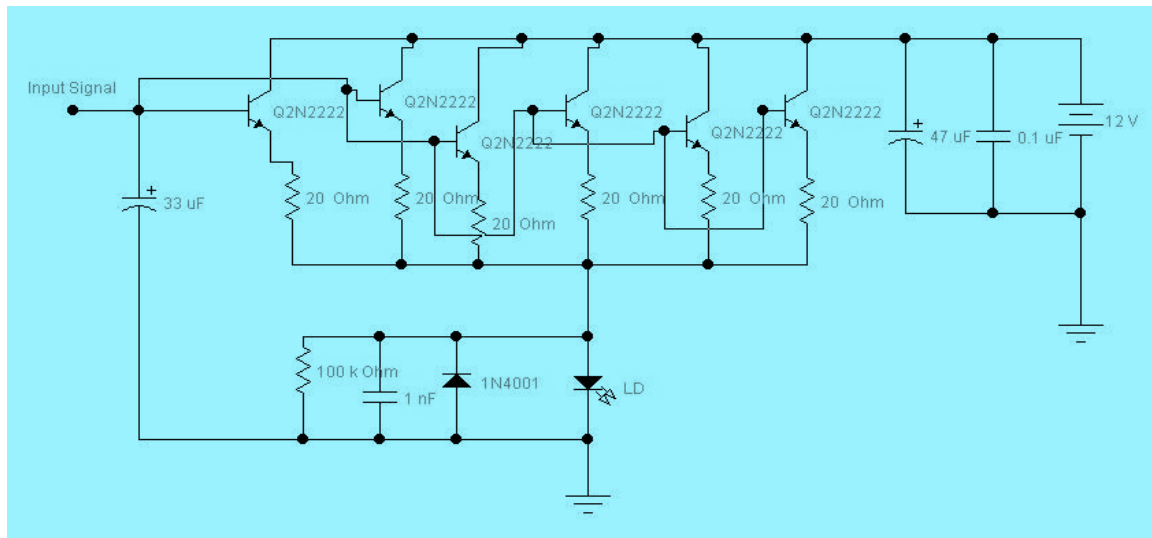


Fig. (3-2) :The transmitter circuit

The transmitter circuit utility is working to upload the data (voice) on the laser as well as working on the repeater circuit, this circuit contains a number of diodes and resistances at the base .also we use two resistance with value 10Ω connected parallel instead of 20Ω . As well as the battery which using with voltage (12 V). The audio input (V_{in}) is taken from the preamplifier output of the music system (Radio, DVD player, mobile etc.).

Electrically, a semiconductor laser behaves as a diode with a voltage turn-on knee greater than 1 V. When the laser is biased with a sufficient current so that lasing occurs, a further increase in injected current results in a proportional increase in laser optical output. For representative laser diodes, the frequency response of optical power output due to a change in laser current is flat out to a resonance at a very high frequency [7].

Components Used for Transmitter circuit

Tab. (3.1) represents the necessary equipments for preparing transmitter circuit.

Tab. (3-1):The important components for transmitter circuit

Resistors	Transistor (Q 2N2222)	Capacitance	Other
R1=20Ω	Transistor1	C1=33Uf	LED
R2=100KΩ	Transistor2	C2=1nF	LED
R3=20Ω	Transistor3	C3=47uF	Battery=12V
R4=20Ω	Transistor4	C4=0.1uF	Diode 1, IN 4001
R5=20Ω	Transistor5		
R6=20Ω	Transistor6		
R7=20Ω			

3-2-2 Circuit Diagram - Receiver:

Fig. 3-3 shows the main receiver circuit which use in this project

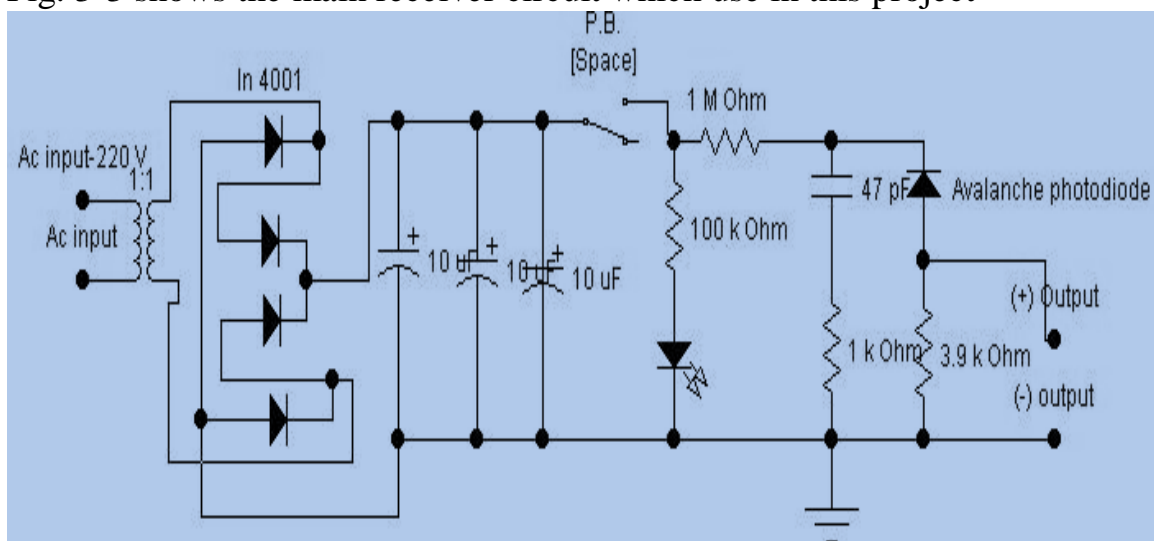


Fig. (3-3) :Receiver circuit

Receiving a circle containing the generator operates to convert voltages from 220 volt to 9 volt .where the circuit contains the detector which works on the receipt of the signal wirelessly and after that amplified the signal by the amplifier and then received in the form of a voice in tied for the department director headset as shown in the fig.3-2 .the recipient sound more purity and less confusion about the sound that has been entered in the transmitter circuit and the reason for this is that the receipt. A switch key contains key works on the entry of the signal through a single pressure.

As a detector for the laser pulses an avalanche photodiode (SHF2030) is employed in the receiver unite. It works as an envelope detector and converts the laser light pulses into electrical pulses . When the photons is incident , the hole -electron Pairs that is forming in the depletion region . Average value of such inner gain depends on the receiver avalanche photodiode supply voltage .Receiver avalanche photodiode (SHF2030) represents a current generator [8]. The generated current pulse is led to the load resistor of the receiver avalanche photodiode (R2=3.9 k ohm) where the voltage pulse is obtained.

Components Used for Receiver circuit

“Tab. 3.2” represents the necessary equipments for preparing receiver circuit.

Tab.3-2: The important components for receiver circuit

Resistors	Capacitors	Diode IN 4001	Other
R1=100KΩ	C1=10uF	D1	LED ,1
R2=1MΩ	C2=10uF	D2	Ac input voltage =220 V
R3=1KΩ	C3=10uF	D3	Avalanche photodiode 61228
R4=3.9KΩ	C4=47pF	D4	switch

3-2-3 Circuit Diagram - Repeater

Fig. (3-4) shows the main Repeater circuit which use in this project

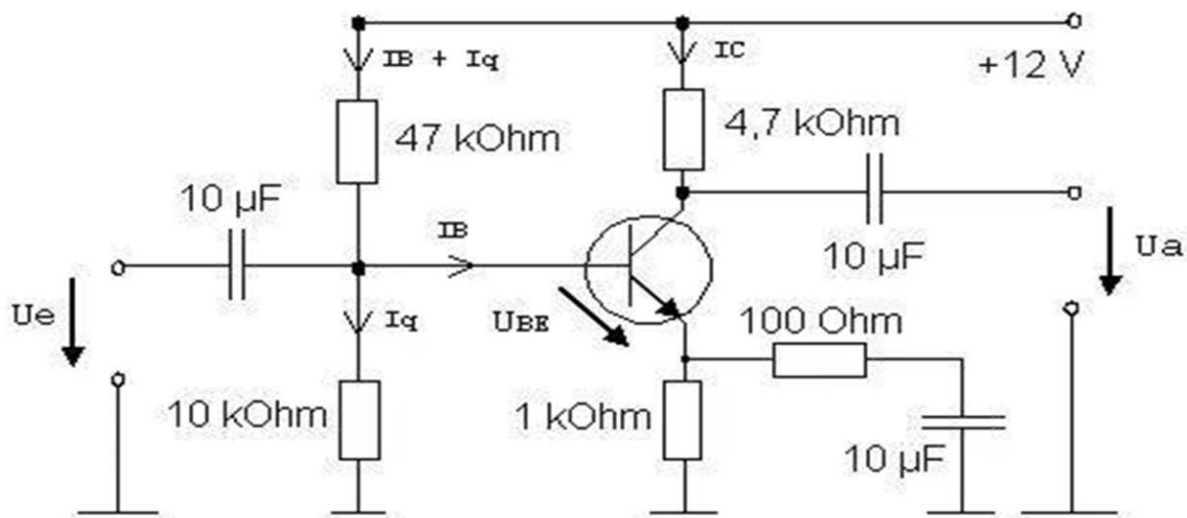


Fig. (3-4) :Repeater circuit

Repeater is an electronic circuit which magnify amplitude signals or tension input signal, we get when the amplifier output signal similar to the reference signal(incoming signal) but at twice the value . So the repeated in the project is an important part, where it works on the receipt of the signal from the transmitter circuit through the detector located in the preamplifier circuit with detector type is(SFH2030), and then received by detector in receiving circuit used in the amplifier circuit affected by the noise because we work free space and we had the current process measurement and effort on both ends of the detector and found that the current value without the laser is (3MA). But the presence of the laser is the present value (4.57mA), and the voltage value without laser (0.23V) and laser (0.6V).

Components Used for Repeater circuit

Tab.(3.3) shows the important components for repeater circuit

Tab.3-3: The important components for repeater circuit

Resistors	Capacitors	Other
R1=47K Ω	C1=10Uf	Transistor 1 2N4401
R2=10K Ω	C2=10uF	Detector (SFH2030)
R3=4.7K Ω	C3=10uF	
R4=1K Ω		

3-3 Design and Working of the System

There are three section namely the sender and recipient and amplifier. Each of the transmitter and repeater have voltage where the source (9 volts), the transmitter circuit includes audio data which represent (V_{in}), where the transmitter circuit works to download data on the Laser, as well as passing the signal and then later receive a circle repeater from transmitter circuit through the detector and then the repeater amplifying the signal received by the electronic equipment used in its own circle, and then the receiving circuit to receive the signal from the repeater via exists in the receiving department detector and then receive voice through found headset when receiving department director .Receiving circuit containing transferred at the beginning of the section works on voltage converter from 220V to 9V counselors will be found by a difference between the voice that has been entered into between the sound that was concluded between the transmitter circuit and the sound that was received at the reception, where the sound when you receive a more pure and less noise.

Chapter Four

Results and Discussion

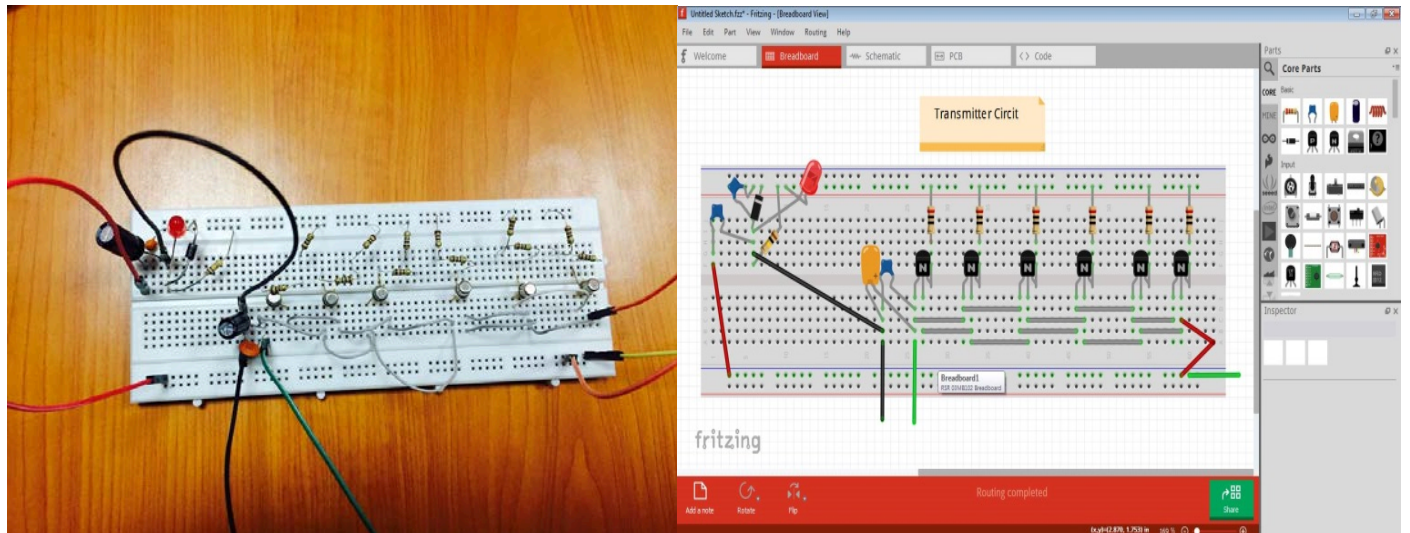
4-1 Introduction:

This chapter is divided into four sections the first section contains design and construction the transmitter circuit ,the second part contains the construction and design receiver circuit, the third part contains repeater circuit, finally the last part contains the construction and operation laser communication system for voice transmission with repeater have unique properties such as inexpensive, small, low power and do not require any radio interference studies.

Also used the (fritzing) program in order to verify the link circuit (transmitter, receiver and repeater circuits).The below figures show how the circuit has been linked elements.

4-2 Transmitter Circuit:

Fig. 4-1 shows the construction of transmitter circuit with components draw by Fritzing program and practically , Electrically, a semiconductor laser behaves as a diode with a voltage turn-on knee greater than 1 V. When the laser is biased with a sufficient current so that lasing occurs, a further increase in injected current results in a proportional increase in laser optical output. For representative laser diodes, the frequency response of optical power output due to a change in laser current is flat out to a resonance at a very high frequency [3]. This resonance is due to laser relaxation processes. In this project, the diode is to be operated at a maximum modulation frequency of a few megahertz. For a 1 Watt at temperature 25°C semiconductor laser, representative values for and are 300 mA and 1.2 A, respectively. to maintain constant optical power output, it is desirable to make the injected laser current independent of temperature. Therefore, the laser is driven with a high impedance current source. The circuit in Fig. 3-1 is capable of delivering 1200 mA to a laser load at full optical power modulation frequencies of 10 MHz, related the input signal it have amplitude



about $30\mu\text{A}$.

Fig. 4-1 : Transmitter circuit

4-3 Receiver Circuit:

Fig.4-2 shows the construction of receiver circuit, As a detector for the laser pulses an avalanche photodiode (61288) is employed in the receiver unite. It works as an envelope detector and converts the laser light pulses into electrical pulses . When the photons is incident , the hole -electron Pairs that is forming in the depletion region . Average value of such inner gain depends on the receiver avalanche photodiode supply voltage .Receiver avalanche photodiode (61288)represents a current generator. The generated current pulse is led to the load resistor of the receiver avalanche photodiode ($R_2=3.9\text{ k } \Omega$) where the voltage pulse is obtained.

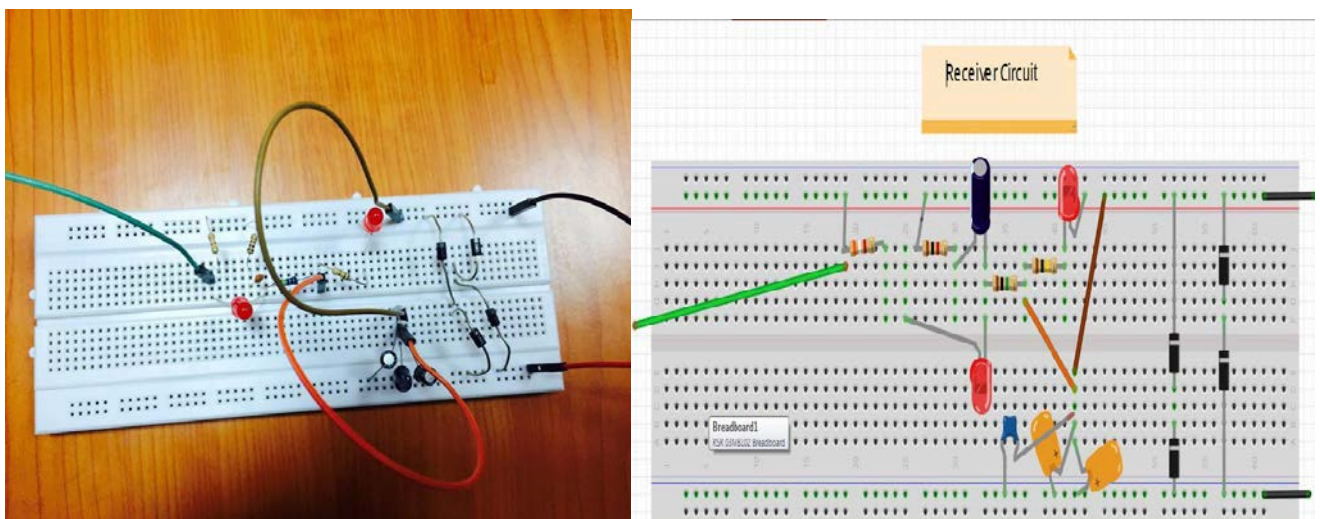


Fig. 4-2 :Receiver circuit

4-4 Repeater Circuit.

Fig. 4-3 shows the construction of repeater circuit. In the case of free space optical communication, the range between the transmitter and receiver is limited by the direct viewing within a line of signal , and for a high – capacity digital system , then repeaters are used to extend the range of the overall system. Repeaters usually designed with the same optical components as the terminal equipment, That is it consists of a detector , low noise ,an amplifier and automatic gain control gain , threshold detection and regeneration, and a laser transmitter circuitry .

The attenuate an dispersed optical pulse train is detected and amplified in the receive unit. This consists of a photodiode followed by a low noise preamplifier . the electrical signal thus acquired is given a further increase in power level in a main amplifier prior to reshaping in order to compensate for the transfer characteristic of propagation medium and the amplifier using an equalizer. Depending on the photodiode utilized, automatic gain control (AGC) may be provided at this stage for both the photodiode bias current and the main amplifier. The main function of the repeater circuit is to reconstitute the originally transmitted pulse train , ideally without error.

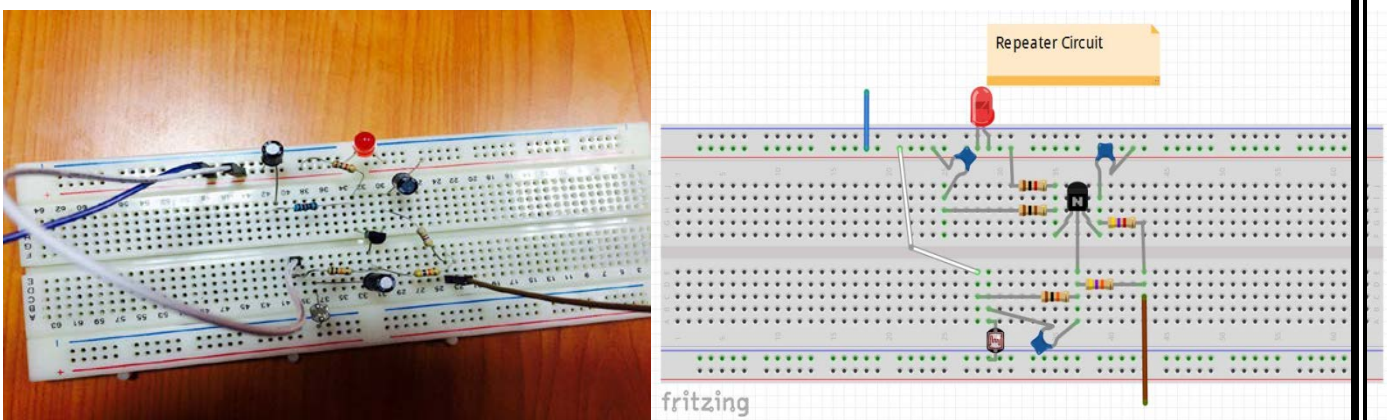


Fig. 4-3 :Repeater circuit

4-5 Design and Working of the System :

In the beginning, we connect the transmitter circuit, repeater and the receiver as shown in above figures using the required components of resistors and capacitors as well as transistor and source voltage value of 12 volts .When you link all the parts are working ,the introduction of sound into a circle transmission via radio or telephone and be a transmitter circuit connected to a voltage of 12 volts and there is a laser belted in the constituency where by transistor located in the department who works on the appropriate sound with lasers that the interest of the transmitter circuit is adapted sound with laser and then the laser is greeted by a preamplifier circuit, where the preamplifier circuit operates as an act of sending and receiving where you receive a laser that has a voice and then act to amplify the received signal, which is received by an existing circuit detector and after amplifying the signal and correct it sends the signal amplified to receiving a circle containing the detector type (SHF2030) works on the receipt of the signal and then transfer it to an existing headset when the department director, where the sound when the receiving circuit more purity, clarity and contain the receiving department to resist size (1Meka Ω) where this resistance is working to reduce the power or cancel the current and operate the amplifier circuit of 12 volts .Fig.4-4 shows the design and working the laser communication system with repeater

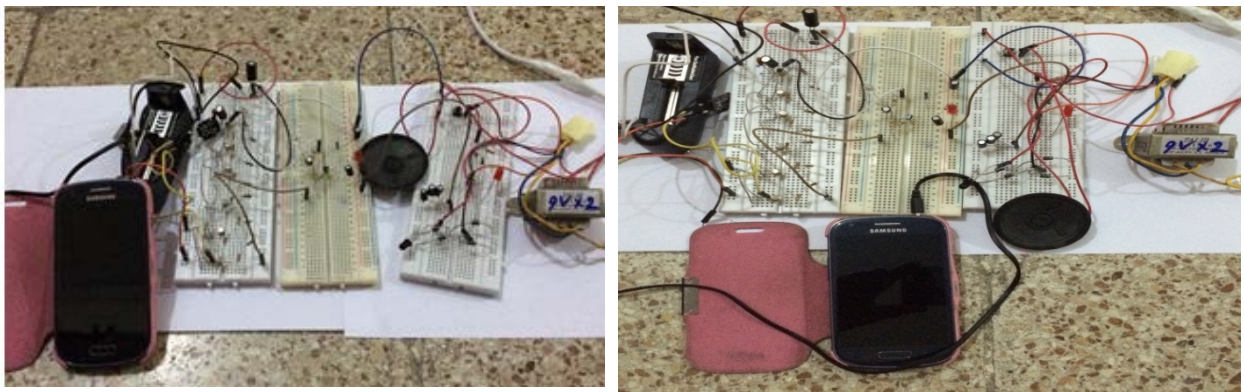


Fig. 4-4 : Design and working the laser communication system with Repeater

Chapter Five

Conclusions and Future Works

5-1 Introduction:

This chapter explain the conclusions and future works related in the project .

5-2 Conclusions

This is wireless technology to transmit sound signal from one section to other section through the laser beam of the system by using repeater. This system is safety and without radiation. so it is not harm to living beings. because of this laser communication system became more popular system than the other system.

Also, This circuits demonstrates the successful application of receiver optical signal ,processing this signal and driver high power laser diode (1W) at modulated frequency (10 MHz), and explain the benefit of using optical repeater to extend the range of the overall system. Repeaters usually designed with the same optical components as the terminal equipment.

5-3 Future Works

Improved design of this system can be used to transmit confidential voice data in remote area where cell phone communication is not possible due to the lack of mobile operator's tower by using extra amplifying circuit at the receiver end or a another type of repeater for having higher efficiency of the system. also we can use another types of laser to improving the function of the this project.

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الخلاصة

الاتصالات هي من أهم الانظمة للتواصل بين الناس .وتستخدم وسائل مختلفة من الاتصالات، والاتصالات الصوتية واحدة من تلك الفئات .من بداية التقدم التكنولوجي استخدمت العديد من العمليات لغرض الاتصالات الصوتية.

الليزر هو أحد وسائل الإرسال وهو ذو فائدة مهمة حيث يكون الاتصال اللاسلكي خاليا من عيوب تشويش الترددات الراديوية ، والتي تعمل على نحو مماثل إلى وصلات الألياف البصرية، باستثناء ينتقل شعاع من خلال الفراغ.

أي نظام اتصالات يتكون من ثلاث اجزاء مهمة المتلقي البصري، وحدة المعالجة الإلكترونية، وجهاز الإرسال البصري ومن المتوقع أن توسيع نطاق نظام الاتصالات بواسطة الليزر يعتمد على عدد ونوعية المكررات.

ويشمل هذا المشروع تحليل ، وتحسين نظام تطوير مستوى التحول إشارة بين أي اثنين من المصادر ونحتاج عادة الى شعاعين متوازيين، واحد للانتقال واحد للاستقبال.

ويتم تضمين الإشارة على حامل يولد بواسطة الليزر دايمود وهناك حاجة إلى شعاعين متوازيين احدهما للإرسال والآخر للاستلام الإشارة الصوتية .ويتم نقل الإشارة من نقطة إلى أخرى عن طريق ضوء مرئي وبعبارة أخرى باستخدام عملية التشكيل.

كذلك يتناول هذا المشروع تصميم وبناء مكرر الضوئية لفائدته في توسيع نطاق نظام الاتصالات الفضائية بواسطة الليزر .



وزارة التعليم العالي والبحث العلمي

جامعة ديالى

كلية الهندسة

قسم الاتصالات



تصميم نظام اتصالات بواسطة المكرر الضوئي

مشروع

مقدم الى قسم هندسة الاتصالات - كلية الهندسة في جامعة ديالى كجزء من

متطلبات نيل درجة البكالوريوس في هندسة الاتصالات

من قبل

حات مثنى

نور الهدى

باشراف

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