

# Voice Transmission System Based on Laser Torch

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Besides this, there are no recurring costs, portability, transparency to network or protocols, although range is limited to a few meters. Also, the laser transmission is very secure because it has a narrow beam. And also, it cannot be detected with use of spectrum analyzers and RF meters and hence can be used for diverse applications including financial, medical, military and industry. Laser can also transmit through the glass; however, the physical properties of glass have to be considered. Laser communication will easily give a communication distance of several meters, and with a parabolic light reflector, up to several kilometers. The laser-induced lubricant pocket generated high local pressures and thus caused a thicker lubricant film, allowing an optical separation of the contact surfaces event at lower sliding velocities. It transmits high quality audio and the link is virtually impossible for anyone.

An important feature of transmission by laser beam is privacy. Because a laser beam is intentionally narrow, it is virtually impossible for someone to tap into the link without us knowing. If someone intercepts the beam, the link is broken, signaling interception occurs. Fiber-optic cables also have high security, as it is very difficult to splice into the cable without breaking the link. However, it is theoretically possible, so for the highest security, probably cannot beat a line of sight laser beam.

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## ABSTRACT

This paper is designed for voice transmission system based on laser torch. In this system, it has two parts; transmitting section and receiving section. The transmitting section mainly comprises with condenser microphone, IC 741, BC 548, BD 139 and laser torch. The receiving section composes with L14f1 photo transistor, LM 386 and Loud speaker. If there is any obstruction in the path of the laser beam, no sound will be heard from the receiver. The gain of the op-amp can be controlled with the help of 1 mega ohm pot meter variable resistor. The AF output from the amplifier is coupled to the base of transistor BD 139, which in turn, modulates the laser beam. The receiver circuit uses NPN photo transistor as the light sensor that is followed by two stage transistor preamplifier and LM 386 based audio power amplifier. The receiver does not need any complicated alignment. The photo transistor is kept towards the remote transmitter's laser point and the volume control is adjusted for a clear sound.

**KEYWORDS:** laser beam, op-amp, amplifier, transistor, gain

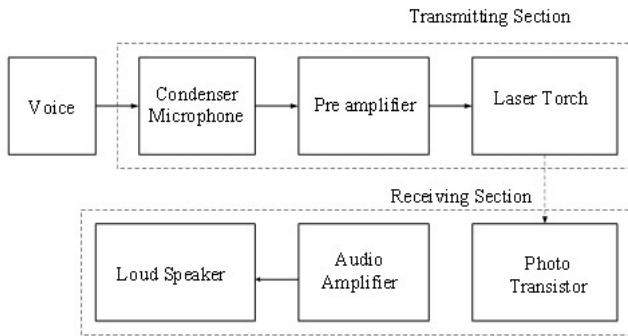
## I. INTRODUCTION

Laser as a communication medium can provide a good substitute for the present-day communication system. Laser is used for communication systems in the future because of the advantage of the full channel speeds, no communication license is required at present, compatibility with copper or fiber interfaces and no bridge or router requirements.

virtually impossible for someone to tap into the link without us knowing. If someone intercepts the beam, the link is broken, signaling interception occurs. Fiber-optic cables also have high security, as it is very difficult to splice into the cable without breaking the link. However, it is theoretically possible, so for the highest security, probably cannot beat a line of sight laser beam. Laser transmitter and receiver ensure easy, straightforward systems alignment and long-term stable, and service-free operation. The laser can also be commissioned in satellites for communication as laser radar requires small aperture as compared to microwave radar. Also, there is high secrecy and no interference like in EM waves. Further, potential bandwidth of radar using lasers can translate to very precision range measurement. For these reasons, laser can be used as an alternative to present mode of communications.

## II. System Block Diagram

The overall block diagram of voice transmission system based on laser torch is shown in Fig.1. In this system, it has the two main parts: transmitting section and receiving section. The transmitting section mainly comprises with condenser microphone, pre amplifier and laser torch. The receiving section composes with Photo transistor, Audio amplifier and Loud speaker. The photo transistor of the receiver must be oriented towards the laser beam of the torch.



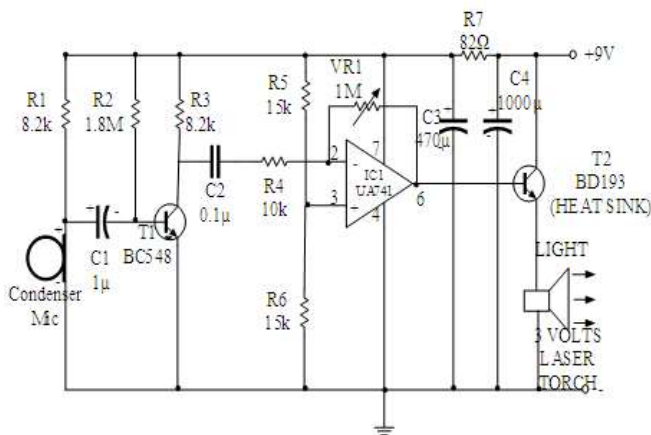
**Fig.1: Block Diagram of Voice Transmission System**

**III. Circuit Description**

There are two main sections: the transmitter board and the receiver board, both powered by 9V. The transmitter board has an electrets microphone module at one end, and the laser diode at the other end. The electronic modulates the intensity of the laser beam according to the output of the microphone. The laser diode has an inbuilt lens and is simply a module that connects to the transmitter board. The receiver uses a photodiode as the receiving element, and the onboard amplifier powers a small 8ohm speaker. This board is therefore a high gain amplifier with a basic audio output stage.

The quality of sound transmitted by the link is quite surprising. Clearly, this system is ideal for setting up a speech channel between two areas, say adjacent houses or offices on opposite sides of the street. And it can be used as a link between the work shop and the house. For two-way communication, it needs two laser channels. An important feature of transmission by laser beam is privacy. Because a laser beam is intentionally narrow, it's virtually impossible for someone to tap into the link.

**IV. Circuit Design of Transmission System**



**Fig.2: Circuit Diagram of Transmission System**

According to the function of condenser microphone, its range is 20 to 20k Hz and works small signal range (mV). The voice comes to the condenser microphone Power supply 9V is used for the transmission circuit and resistor 8.2kΩ is used to pull up small signal (mV) to 4.5V. Capacitor C1 charges this voltage. When the time capacitor discharges, the signal reaches to the base of the transistor T1(BC 548) and it can work the transistor. And RC filter is used to reduce noise. The output signal of the transistor T1 (BC548) is at the collector and which is amplifies the small signal comes from the base. C2 is coupling capacitor and it works for DC block. The reference voltage of operational amplifier (IC741) is 4.5V. And the output of the operational amplifier is used as

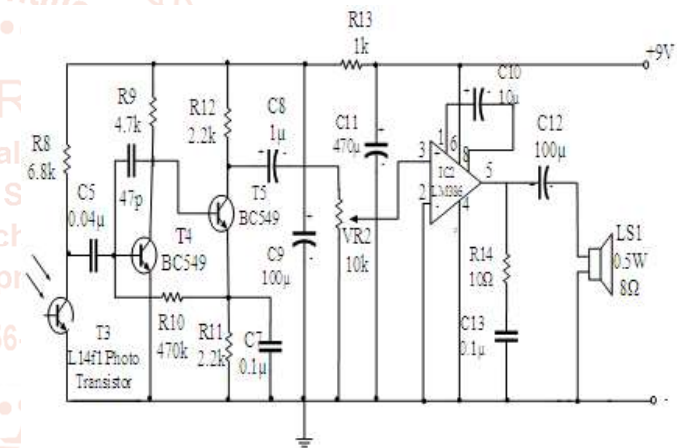
the feedback using variable resistor VR1 depending on the signal waves.

When the voltage used as the feedback is below the reference voltage, the input voltage at pin2(inverting input) is 0V. When the voltage as the feedback is above the reference voltage, the input voltage at pin2 is 9V. R7, C3 and C4 is used for power filter to avoid power drop. The output signal of the op-amp drives to the base of the transistor T2(BD139) and the emitter of the BD139 is connected to the laser torch.

In the transmitter circuit, the laser diode is supplied via an adjustable constant-current source. Note that the metal housing for the laser diode and the lens also acts as a heat sink. The laser diode should not be powered without the metal housing in place.

**V. Circuit Design of Receiving System**

The transmitted signal is picked up by the photo transistor in the receiver as shown in Figure.4.2. The output voltage of this diode is amplified by the common emitter amplifier around T4. At this stage, RC filter is used to reduce noise. The output signal of transistor T4 is routed to T5 for amplify the signal connected to the inverting input of LM386 audio amplifier and used VR2 to adjust the voice signal.



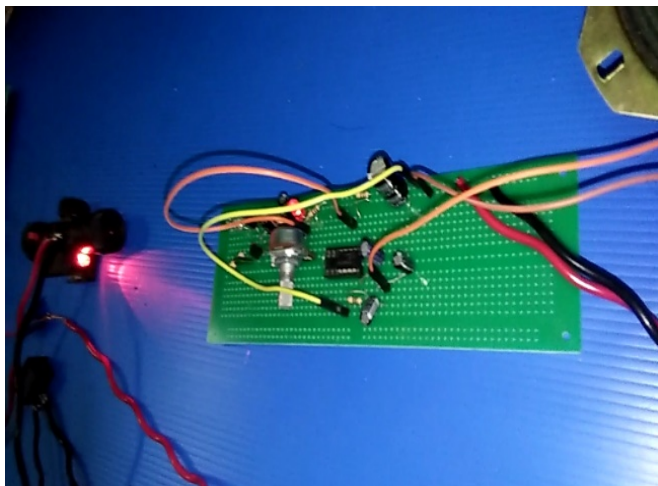
**Fig.3: Circuit Diagram of Receiving System**

When the volume control is pick up, the input signal will go to the inverting input with full channel. When the volume is pick down, 0V is used. Because non-inverting amplifier is used, the output is as positive. C10 and C12 is used for DC block. And then, the signal reaches to the speaker and the voice will hear.

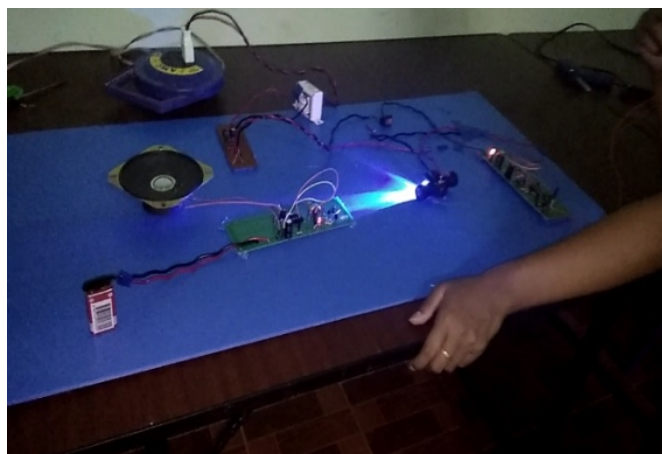
**VI. Results**



**Fig.4: Testing Result of Transmitting Circuit**



**Fig.5: Testing Result of Receiving Circuit**



**Fig.6: Testing Result for Alignment of Transmitter and Receiver Circuit**

### VII. Discussion

This system has successfully designed and constructed for voice transmission system based on laser torch. This system can be used successfully at conference room, political assembly, and class room and for general conversation between two houses. It is better to use for general

conversation with neighbors where confidentiality is a prime issue. This system has been widely increased our knowledge about laser communication. Laser are used today in domestic and international network. This system eventually provide the bandwidth that is in such demand. Laser torch based voice transmission and reception are cheaper and simpler in construction than RF transmitter and receiver. Infra-Red and Blue-Tooth can also be used for voice transmission and reception purpose, but their range is small compared with their price.

### VIII. Further Extension

This system can be advanced by using half duplex or even full duplex communication can be achieved by software implementation. A more powerful laser can be used to increase the range of communication. Laser can be replaced by IR laser that can't be visible by bare eye.

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