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LASER BASED COMMUNICATION

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Abstract:

This work presents a point-to-point transmission of voice signal wirelessly through the atmosphere with a LASER diode or infra-red device. Optical communication is gaining popularity because of its high bandwidth, low loss power, high security, low cost, and most importantly no electromagnetic interferences. Laser communication is one of the key areas in Wireless Communications. 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. Two parallel beams are needed, one for transmission and one for the reception. Wi-Fi is the wireless technology used to connect computers, tablets, smartphones, and other devices to the internet. Wi-Fi is the radio signal sent from a wireless router to a nearby device, which translates the signal into data you can see and use. LiFi is a wireless optical networking technology that uses LEDs for data transmission. In simpler terms, LiFi is considered to be a light-based WiFi that uses light instead of radio waves to transmit information. Using light to transmit data allows LiFi to deliver a couple of advantages such as working in areas susceptible to electromagnetic interference like hospitals and aircraft cabins and working across higher bandwidth while offering higher transmission speeds.

Keywords:

Wireless Communication System, Laser Communication, Audio Amplifier, Transmitter, Receiver and Working

1. INTRODUCTION

A Laser communications system is a wireless network through the atmosphere which carries the information in the light domain rather than the electrical domain in RF communication. Laser communications systems can be implemented in point-to-point communication easily because of their low cost, small hardware, low power, and absence of electromagnetic interference. For two-way communication two parallel beams are required, one for transmission and another one for the reception of a signal. The input which is in the form of voice is initially amplified with a pre-amplifier circuit before further amplified by the second stage amplifier which provides the overall gain of the transmitter. The signal is then fed to a Laser diode through a driver circuit. Laser will convert the electrical signal into light signal and send the signal into free space.

3. WORKING PRINCIPLE

Laser: The acronym LASER (Light amplification by stimulated emission of radiation) is a device that emits a beam of coherent light through an optical amplification process. There are two types of emission as spontaneous emission and stimulated emission. If the atom is in the ground state, with energy E1, the photon may be absorbed so that it is exciting to the upper energy level E2. Subsequently, de-

excitation will occur randomly producing the emission of radiation. This process is spontaneous emission. On the other hand, if the atom is already in the excited state, then the incident photon may stimulate a downward transition with the emission of radiation. Photons emitted in this process are coherent with the stimulating photon i.e both the stimulating and stimulated photons have the same energy, same momentum, and same state of polarization .The input can be in the form of audio from jack input or voice from the condenser mic at the transmitter.

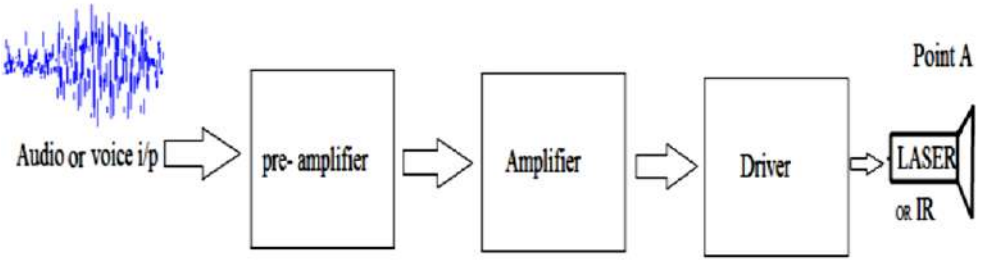


Figure 1. Transmitter section of LASER Communication

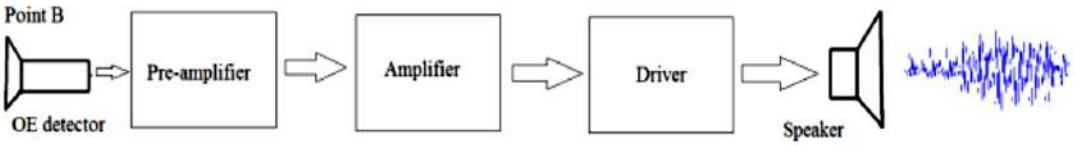


Figure 2. Receiver section of LASER Communication

LASER COMMUNICATION:

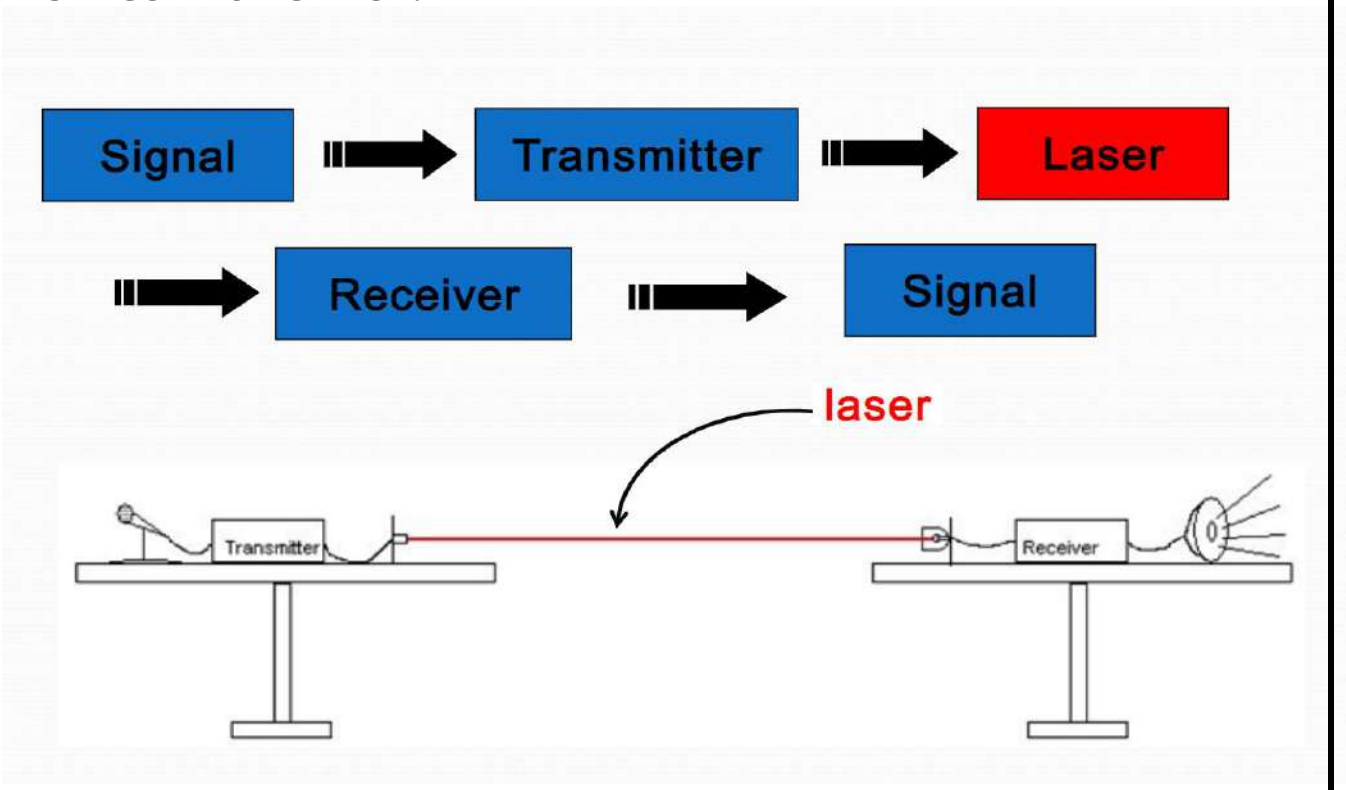


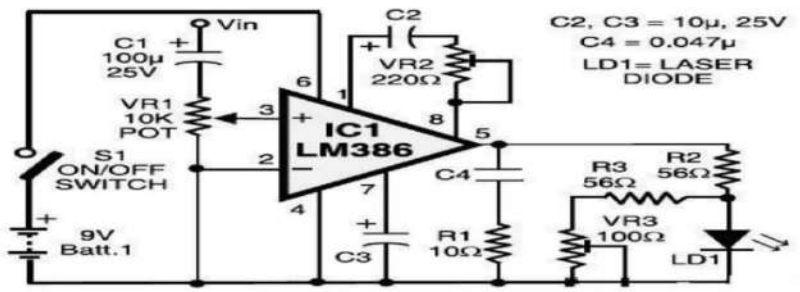
Figure 3. BLOCK DIAGRAM

The low audio signal is initially amplified with a one-stage transistor pre-amplifier circuit before passing through the second stage amplifier which is built with LM 386 providing the overall gain of the transmitter. The amplified signal is then fed to a Laser diode which converts the electrical signal into a light signal and transmits it into free space. The transmitter attains modulation of the Laser signal which acts as a carrier by the modulating signal from condenser mic or audio jack input.

Sound or different mode of a signal is amplified and transmitted through laser. By giving the output as sound energy to the input of a laser, which can help to carry the signal from one place to another, the signal travels along with lasers to the receiver end... For example, we can tack a radio station as an example we can transmitter itself generates a radio frequency alternating current, which is applied to the antenna to transmitted signal similar to this we can transmit the signal with laser because lasers have high frequency and high speed is 186000 miles (ca. 299,338 km) per second..

3.1 TRANSMITTER:

CIRCUIT DIAGRAM - Transmitter:



Transmitter Circuit

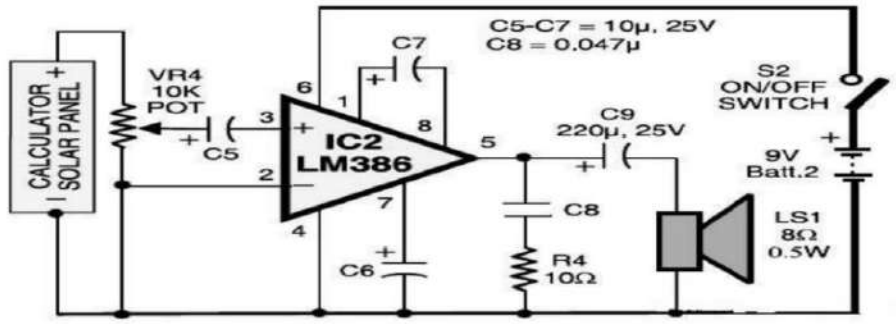
3.2 RECEIVER

In the receiver end, the transmitted laser reaches the LDR (light dependent resistor) that can again amplify the signal to the audible range in case we are using that transmitting the audio signal we can receive audio signals. For example, we can tack a household radio receiving system as an example Radio wave are received by another antenna attached to a radio receiver. When radio waves strike the receiving antenna they push the electrons in the metal back and forth, creating tiny oscillating currents which are detected by the receiver. Here we are using LDR as the antenna to receive the signal or light from the laser. We are preferring laser for its can travel at high speed and it can travel vacuum so it is used to share information in outer space in minimum delay...even we can use any computer data, ah sharing in same speed using this method.

APPLICATIONS:

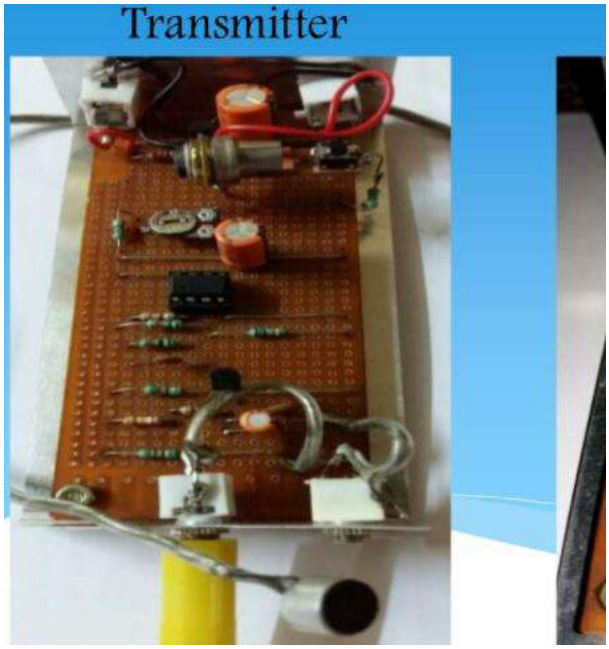
- In the Laser communications systems, bandwidth could be distributed in neighbourhoods by putting laser communication systems on top of homes and pointing them towards a common transceiver with a fast link to the Internet.
- With the powerful laser, it would even be possible to communicate using satellites to reflect the signals.

CIRCUIT DIAGRAM – Receiver:



Receiver Circuit

PHOTOGRAPH:



ADVANTAGES:

- ✓ It can provide speed more than 1GBps.So it overtakes the LAN or wireless LAN comprehensively.
- ✓ 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. Two parallel beams are needed, one for transmission and one for reception.
- ✓ Even by a minute fraction of a degree, the laser will miss by thousands of miles. Instead of better and faster pictures, there could be no pictures.

CONCLUSION:

This is new wireless technology to transmit the data or sound signal from one section to another section through the laser beam of the system. This system is safe and without radiation. So it is no harm to living beings. The system can likely transmit data and sound much faster than the other system (like 1GB/s) because this laser communication system became a more popular system than the other system. The paper firstly analysed the components of maritime laser communication systems, the paper made some explanations on the components and functions of the servo system.

RESULT:

Although we could not pin point the exact reason why the reliability of our audio transmission fell drastically at bauds higher than 27.7 kbps, we do suspect that is has something to do with a timing problem involving the time required by the ADC to complete a conversion since the biggest difference between the audio code and the text code is that the audio utilizes the ADC

and transmits continuously. So ultimately the baud limitation did not degrade the quality of the transmitted audio.

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