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Research Article

LASER COMMUNICATION SYSTEM USING SOLAR CELL

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ABSTRACT
This paper investigates the design of an amplifier using Laser as Transmitter and Solar Panel as Receiver. The input given is an mp3 song from a mobile phone which is a low signal input. It is then amplified by the amplifier so a high input signal is being generated. This paper deals with the fabrication of modulator and demodulator circuits which uses microphone as an input and loudspeaker as an output. The high input signal generated by the amplifier is then transmitted by a Laser Diode. This Laser Beam is given as input to the Sensor (Solar Panel) which is amplified by an amplifier so that a high signal is being generated. A 9v DC Power Supply is given to the Amplifier by a battery. The generated high output signal is given to the loud speaker.

***Key Words**: Amplifier Lm386, Transmitter, Receiver, Solar Panel, Laser Diode*

INTRODUCTION
Laser communication system is one of the modes of telecommunication which occurs through wireless connections in the atmosphere. Laser communication came into existence in 1960 and since then many advancements have been made in this discipline. In this mode of communication, the information is transferred through free space. In the laser mode of communication; the signals are transmitted from the wireless transmitter to a wireless receiver without any hindrance or obstruction. Such condition is also called line of sight condition where the signals are transmitted without any obstruction. Laser diode is the major carrier in this mode of communication. This mode of communication is also faster as compared to the other modes and thus is mostly preferred over other types of communication system.

MATERIALS AND METHODS
Transmitter
It uses a microphone i.e., the mp3 song from the mobile as shown in figure(4), modulator and an amplifier with an antenna as shown in figure(1). The input is an mp3 song given from the mobile phone which is a low signal input. It is then amplified by the amplifier LM386 so a high input signal is being generated. A 9v DC Power Supply is given to the Amplifier by a battery. The high input signal generated by the amplifier is then transmitted by a Laser Diode. This Laser Beam is given as input to the Sensor (Solar Panel).

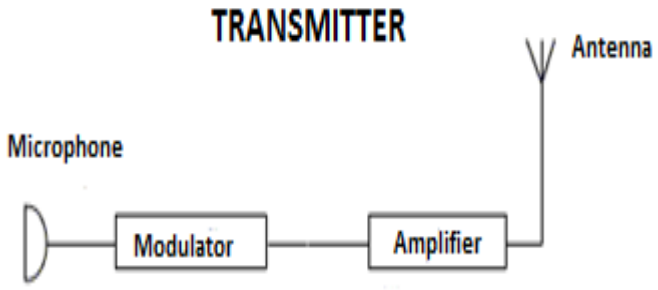

Figure 1

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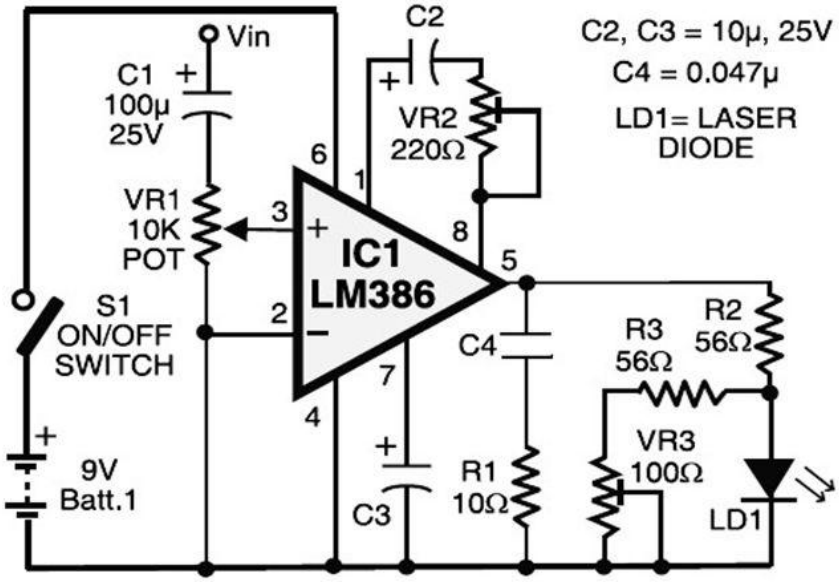

Figure 2: Circuit diagram of transmitter

Working LASER communication transmitter

This laser communication system transmits sounds though a laser beam. The intensity of laser beam changes with the amplitude of sound signal coming from the mobile. The variation in LASER beam intensity is converted to variation in voltage level by a solar panel. The voltage variation in solar panel is amplified by a low voltage audio power amplifier LM386 and reproduced by speaker. The maximum output of audio amplifier LM386 is 1 watt, while its voltage gain is 20 to 200. Here laser diode with maximum operating voltage 2.6Volt and maximum operating current 45mA is used to transmit the audio signal. Potentio meter VR1 is used to change the level of the input audio signal. The gain of audio power amplifier LM386 IC can be varied by Capacitor C2 and potentiometer VR2

Receiver

Laser beam is the input of the receiver circuit. It uses a solar panel, amplifier, demodulator, audio amplifier and a loudspeaker as shown in figure (3). The transmitted light is received by the solar panel and amplified by audio power amplifier LM386.The gain of the amplifier is fixed by capacitor C7. Preset VR4 is used to change the signal level from solar panel. C5 acts as coupling capacitor it removes the DC voltages from the solar panel. The output is fed to speaker via another coupling capacitor C8

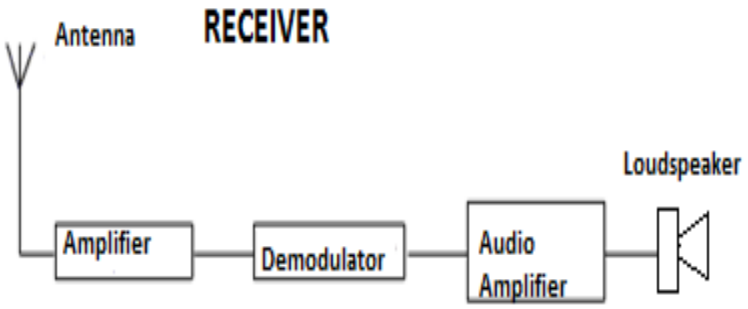

Figure 3

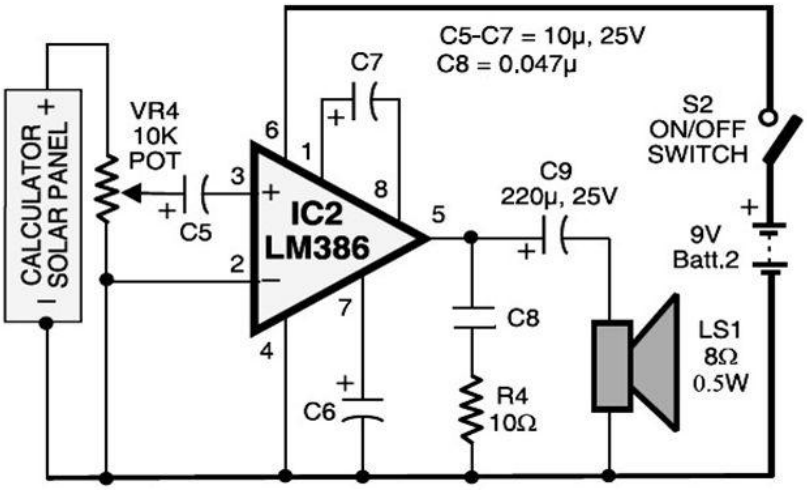

Figure 4: Circuit diagram of receiver

Working LASER communication receiver

The transmitted light is received by calculator's solar panel and amplified by audio power amplifier LM386.The gain of the amplifier is fixed by capacitor C7. Preset VR4 is used to change the signal level from solar panel. C5 acts as coupling capacitor it removes the DC voltages from the solar panel. The output is fed to speaker via another coupling capacitor C8 (M Scheinfeild *et. al.*,1997).

Amplifier

The LM386 is a low voltage power amplifier (audio amp chip) IC is designed for use in low voltage customer applications. The inside gain is set to 20, but adding of an external resistor and capacitor between pins 1 and 8 will enlarge the gain to any value from 20 to 200. LM386 low voltage power amplifier circuit schematic is given in this wireless LASER communication project (Arnon, 1997). The inputs are ground referenced while the output automatically biases to one half the supply voltage. The quiescent power drain is only 36 milli watts when operating from a 9 volt supply (Pursley, 1997). Here a laser communication transmitter and LASER communication receiver circuit schematic is described.

Modulator

In radio communication signals from various sources are transmitted through the free space. This causes interference among various signals, and no useful message is received by the receiver. The problem of interference is solved by translating the message signals to different radio frequency spectrum. This is done by the transmitter by a process known as *modulation.*

Modulation is a fundamental requisite for communication to achieve long distance communication. Modulation may be defined as the process by which some parameter of a high frequency signal termed as carrier, is varied in accordance with the information or modulating or baseband signal.

The carrier is supposed to carry the message signal or information from transmitter to receiver. The term baseband designates the band of frequencies representing the signal supplied by the source of information. The device which does this modulation is known as *Modulator*. There are many types of modulators like PAM, PPM, PWM, PCM, DM, ADM, DPCM etc (Halle *et al.*,1993).

Demodulator

The process of extracting a modulating signal from the modulated signal is called **demodulation** or **detection**. The device which demodulates is known as **Demodulator.** These demodulators are used in TRF Receiver, Super Heterodyne Receiver. Example: - Envelope Detector.

Solar Panel

The receiver used for this project is a solar panel. The transmitted light is received by solar panel and amplified by audio power amplifier LM386. The solar panel has the following advantages.

- They are light weight.

- They don't even need an on/off switch since power is readily available for them, unless to avoid running down the battery at night.
- They don't need a battery to work during daylight hours.
- When a battery is included, they will work in any circumstances as long as they aren't stored in the dark perpetually.
- They are inexpensive.
- They are readily available.
- A wide choice of styles and functions are available.
- The solar panels that power them will last for years, it will seem like forever.
- They provide one of the easiest ways to begin using solar power.

Experimental set up

Figure 5

The figure 5 shows the experimental set up of laser communication method of transferring a mp3 song from a mobile to the transmitter circuit. It is then received by a receiver through solar panel. The modulated version of the mp3 song is verified using a speaker at the output. A 9V battery is connected for both the transmitter and receiver circuit.

RESULTS AND DISCUSSION

The given mp3 song from the mobile phone which is a low signal input is amplified by the amplifier LM386. A 9v DC Power Supply is given to the Amplifier by a battery. The signal generated by the amplifier is then transmitted by a Laser Diode. This Laser Beam is given as input to the Solar Panel. A 9v DC Power Supply is given to the Amplifier by a battery. The generated high output signal is given to the loud speaker as shown in the set up figue (5). It was observed that there were some disturbances while transmitting the signal due to Room Light.

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