

# Audio Transmission using Light Fidelity (LI-FI)

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## ABSTRACT

This document gives basic information and relative study about Li-Fi and its application related to information transmission. In Li-Fi, visible light frequency spectrum is used for information transfer who is similar to traditional forms of wireless communication such as Wireless- Fidelity (Wi-Fi), Bluetooth, etc in which data is transmitted over the radio frequency signals. By modulating the intensity of light source like LED, LASER Diode, etc is used as a transmitter and by using a photosensitive detector like Solar Panels, Photodiodes for demodulation of the light signals to convert back data into electrical form at receiver. There is a need of Li-Fi technology in today's fast developing world, to overcome the problem faced by the conventional wireless communication system like Wi-Fi.

**Keywords:** Li-Fi, Photodiodes, Wi-Fi, Light Signals, wireless communication.

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## INTRODUCTION

Li-Fi is a revolutionary technology which was first introduced in 2011 by Harald Haas, a professor at the University of Edinburgh. In this technology, light waves are used instead of radio waves to transmit data. This technology uses light sources like LED to transmit data and it can achieve speed up to 224 Gbps. Li-Fi operates on a simple principle which is of transforming ordinary lights into data transmission source through the modulation of light intensity. It enables the higher data transfer rates than the conventional systems like Wi-Fi, offering a better solution to this increasing demand for higher bandwidth and enhanced security.



Figure 1

## LITERATURE SURVEY

A Several researchers have done considerable amount of work relating to Li-Fi it is as follows:

In [1], They explore the necessity for Li-Fi and its various applications in different fields. In today’s overcrowded digital communication world, Li-Fi is a new and better way of wireless communication that uses light source like LED lights to transmit data wirelessly through a medium. Instead of using RF Antennas, Li-Fi uses LED bulbs with transceiver.

In [2], It is described that every light source can be converted into Li-Fi signal transceiver to transfer data and it results in safer, cleaner, greener and brighter future.

In [3], They presented the designs and results of a small-scale prototype of a vehicle-to-vehicle communication system using Li-Fi. Vehicle-to-vehicle communication is the most effective way that has been used in order to reduce vehicles accidents.

In [4], This paper presented, the process of data transfer through the visible light. On the transmitter side Keypad is used as the input information signal and at the receiver side, light dependent resistor will receive the light signal and correspondingly generate an electrical signal proportional to it.

### BLOCK DIAGRAM

A typical Block Diagram of Li-Fi is shown in figure 2. It Consist of Lamp Driver Circuit which is used to modulate the signal and then transmit it towards receiver through LED or Lamp. A Solar Panel is used at Receiver end to detect incoming Light. A Pre-amplified Speaker is used at Receiver end to recover original signal.

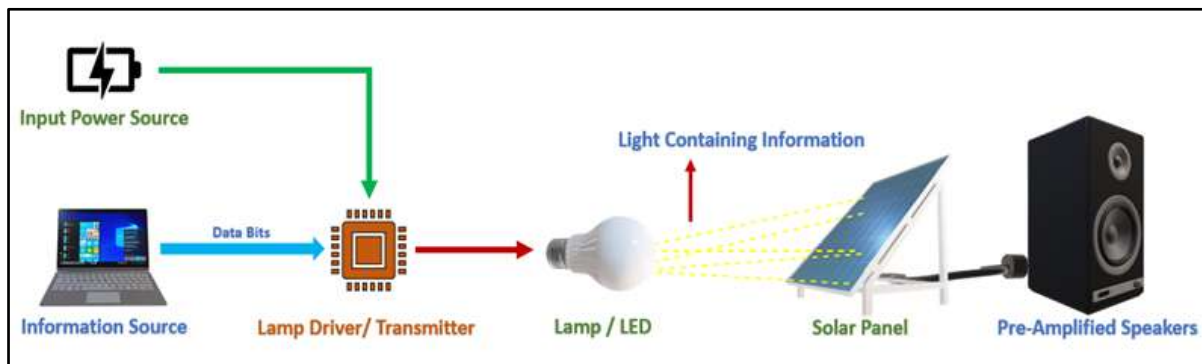


Figure 2

### CIRCUIT DIAGRAM

A Circuit Diagram of Project is shown in figure 3. Here IC LM386 is used in Transmitter for modulation of Audio signal. A 1W LED is used as Light Emitter device whereas a Solar Panel is used as detector in Receiver section. A Pre-amplified Speaker is used at receiver as shown below.

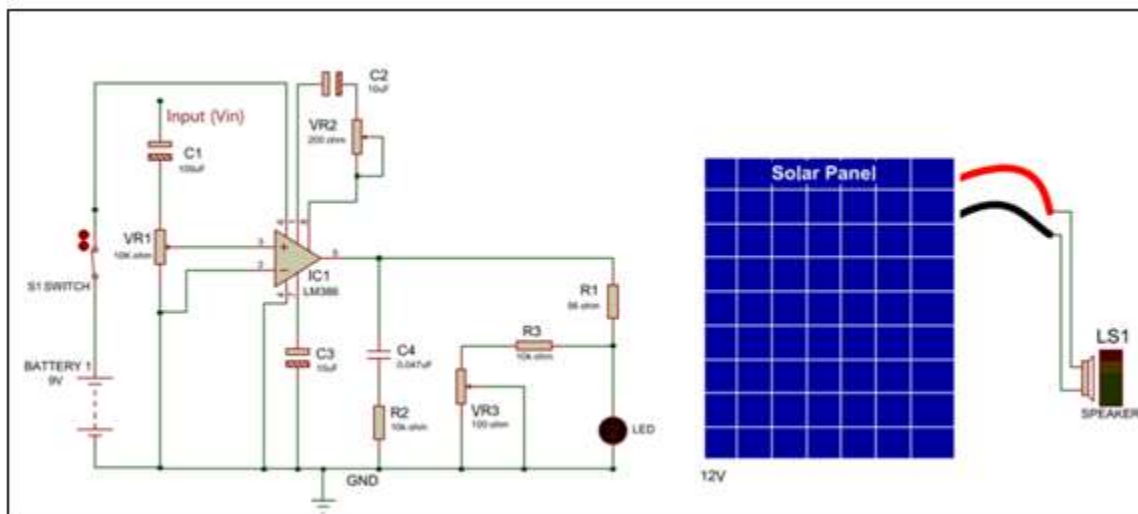


Figure 3

**Advantages**

- a) Speed of Data transmission is very high.
- b) Better security through the use of light waves.
- c) System Provides Low latency for real-time communication between Transmitter and Receiver.
- d) No radio frequency interference like similar existing technology.
- e) Integration with existing lighting infrastructure leads to better utility.

**Disadvantages**

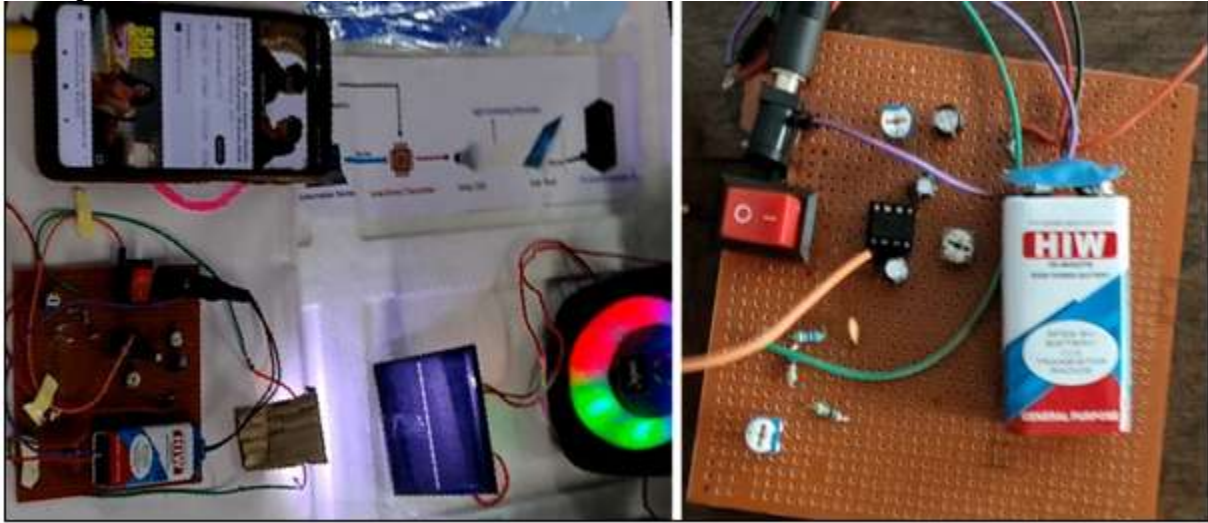
- a) Li-Fi requires a direct line of sight between the transmitter and receiver which in turns limits its usability.
- b) The coverage area of Li-Fi is limited to the range of the light source.
- c) Sunlight and other ambient light sources can interfere with Li-Fi signals.
- d) Sensitivity to obstacles like Walls.

**Comparison with Existing Technology**

**Table 1: Comparison between Li-Fi and existing Technologies**

Parameters	Li-Fi	Wi-Fi	Bluetooth
<b>Full Form</b>	Light fidelity	Wireless fidelity	Bluetooth
<b>Interference</b>	Less Interference, it can pass through salty sea water, works in a dense region but light is blocked by the walls.	There are interference issues from nearby access points.	It interferes with other technologies.
<b>Privacy</b>	More secure data transmission	Less secure.	It offers various security modes
<b>Speed</b>	Almost greater than 10Gbps	150Mbps	Up to 100 Mbps in a 20 MHz channel.
<b>Operation</b>	It transmits data using light with the help of LED lamps.	It transmits data using radio waves.	At least two Bluetooth devices has to exist for data transfer.
<b>Range</b>	Up to 10 meters	Up to 32 meters	Up to 40 miles
<b>Cost of System</b>	Low	Medium	Medium
<b>Applications</b>	Underwater explorations, Hospitals, airlines, etc	Internet	Data and Files Transfer.

**Actual Setup**



**Figure 4**

**CONCLUSION**

Li-Fi uses visible light signal for data transmission which provides high-speed wireless communication with better security. There are many challenges like the need for a direct line of sight (LOS), Sensitivity to obstacles, etc. but many research is in progress which helps in solving these issues. Also, efforts are in progress for standardization of this technology and for advances in it, which leads Li-Fi to hold promises for future wireless communication and Success in expanding coverage area as well as demonstrating practical utility of Li-Fi which could position it as a significant player in these evolving technologies.

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