



# HIGH SPEED WIRELESS AUDIO DATA TRANSMISSION USING LI-FI TECHNOLOGY

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**Abstract:** Li-fi is a new generation technology that can provide high speed and secure data. It is developed by the German scientist Harald Haas. The old Wi-Fi technology gives us 150mbps speed. But it is not enough for new era of technology So, boost up and provide highly secure data transfer wirelessly Li-fi technology was developed. It's a light fidelity technology that can provide long range data transfer faster way above Wi-Fi. In our paper we are describe the use of li-fi technology in wireless audio data transfer. Her in this paper we are sending data through an LED light source. Also LED light source faster than the human eye .li-fi provides higher bandwidth speed above the Wi-Fi. Here in our paper we show you how Li-fi is working in audio data transfer through from a LED source.

**Keywords:** - Wireless Communication; Photodetector; Transmitter; Receiver; LED.

- 1. Introduction:** New technologies have been developed in response to the requirement for data access at ever increasing speeds. By 2025, there will be more than 74 billion connected devices, predicts the availability of fixed bandwidth makes it increasingly challenging to enjoy high data transfer speeds and to create a secure network as the number of devices accessing the Internet rises. Due to this, there is currently a spectrum shortage, which techopedia defines as "possibly not having enough wireless frequency spectrum to support an increasing number of consumer devices." Wi-Fi operates on radio wave spectrum, which has availability, speed, security, and capacity issues. German scientist



Harald Haas suggested Light Fidelity, or Li-Fi, as a replacement for Wi-Fi in his TED Global Talk presentation. He described it as high-speed, bidirectional data transmission that makes use of the visible light spectrum. The availability, speed, security, and capacity issues are all addressed by the visible light spectrum, which is also the safest substitute for radio frequency. It is also possible to transport data at very fast speeds using the ubiquitous LED light bulbs. Light Fidelity uses flickers that are invisible to the untrained eye to communicate signal by changing the brightness of light coming from LED light bulbs. The LED flashes ON and OFF while sending strings of 0s and 1s, respectively, to transmit data. Several writers have discussed modulation approaches. This project displays a straightforward light fidelity network that gives output to speakers after transmitting data as sound using LED light bulbs (the transmitter). Li-Fi operates on the principle of visible light communication (VLC), using the visible light spectrum to transmit data. Light-emitting diodes (LEDs), commonly used for lighting purposes, serve as the backbone of Li-Fi technology. The key concept involves modulating the intensity of LED lights at a rapid rate, undetectable to the human eye, to transmit binary code. Photodetectors, such as photodiodes, are then employed to receive and decode the transmitted signals, completing the bidirectional communication process. Unlike Wi-Fi, which relies on radio waves, Li-Fi utilizes the abundant and unregulated spectrum of visible light. This not only mitigates the issues of electromagnetic interference but also opens up new avenues for high-speed data transfer. Theoretically, Li-Fi can achieve data transfer rates of several gigabits per second, surpassing the capabilities of conventional Wi-Fi technologies.

- Literature Review:** Deepali Javale, Sujata Wakchaure, Sahil Patil, and Chinmaya Sasital created a module which have two modules. First module is receiver node and it consist Arduino with photo-Sensor. Another module is a transmitter node and it consist Arduino with LED. Here the transmitter computer transforms the data to be sent into a bit stream. At the transmitter node, this bit stream is then sent across the LEDs. The digital data will be converted into optical data signals by the LEDs blinking in accordance with the received bit stream. Consequently, a visible light form is encoded from a digital bit stream. The light signal is then decoded into an equivalent hit stream at the receiver node.



After that, this bit stream is rebuilt in order to retrieve the data in its original digital file format. The photo sensor provides output to the receiving computer after detecting variations in light intensity [1]. Mohammad Ali Naqi Niarami, Najmeh Bahrami implemented a project based upon VLC (visible light communication). Which can be used in outdoor and indoor also. In outdoor the street light contains cellular network and it uses data transfer into vehicles. This kind of data transmission is low cost and secure. VLC (visible light communication) can be used in indoor places like home, office etc. Also, the cellular network compile with home LED light source. It provides data to the home appliances like computer, Television, Smartphone etc. [2]. Subham Chatterjee, Shalabh Agarwal, Asoke Nath discussed about scope and challenges in light-fidelity Technology in their paper. In this paper they compare between the speed of data transfer between Li-Fi and Wi-Fi in different conditions. The speed of Wi-Fi in between 54-250 Mbps and the speed of li-fi is 1-3.5 Gbps. IEEE stand of Wi-Fi is 802.11b and IEEE standard of Li-Fi is 802.15.7. Spectrum range of Wi-Fi is radio spectrum range and the spectrum range of Li-Fi is 10000 times then Wi-Fi. The network topology of Wi-Fi is point -to -multi point and the network topology of Li-Fi is point-to-point. Frequency band of Wi-Fi is 2.4 GHz and Li-Fi is 100 times of THz [3]. The author ADDEN LUTTON said that radio frequencies cause explosion in real time when contact with petroleum product. Here in this paper the author described on natural gas extraction. IN the downhole natural gas reservoir, a monitoring system is placed in the downhole that can measure the gas pressure and temperature related data and send upward to the receiver. The gas pipes length are more than 10000 meters. When the radio frequency passed along the pipe chances of explosion arises. To avoid this type of accident we can use li-fi technology. It is safe and do not produce any radiofrequency wave [4-10].

Because solar panels are so sensitive, even slight changes in intensity can cause a commensurate shift in the voltage at the panel's output. Thus, voltages will vary based on the intensity of light when LED light strikes the panel. Next, the solar panel's voltages are sent into a speaker amplifier, which amplifies the signal and provides.



**3. Design & Simulation:** The block diagram of the design which is proposed is been delineated in Fig.1 the light-fidelity is used in wireless data transfer in the help of light emitting. This system provides high security data transfer. In that system here we describe about the how a small LED light-Ray reflect on the solar panel. Here solar panel acts as a receiver.



Figure 1.block diagram of data transmission through light

### 3.1 Working of the Project:

There are two modules in this project: -

- a. Transmitter module (LED)
- b. Receiver module (with solar panel)

A DC power source is connected to the 3.5mm audio plug located at the transmitter module LEDs. (In our project, a 9V battery). We play music by plugging in our smartphone or mp3 player using the 3.5mm audio connector. The music is now transformed into digital data and transmitted through the LED by rapidly blinking, a phenomenon that is invisible to the human eye. The receiver module is now receiving the transmitted signal. A solar panel and speaker are connected at the transmitter module. When light signals hit the solar panel, the panel transforms digital data into analog data, or electrical form, which it then sends to the speaker, which then starts playing music.

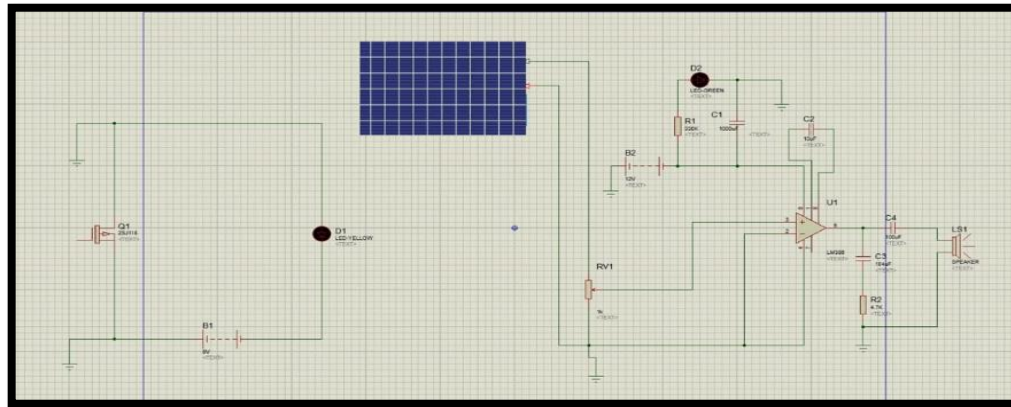


Figure 2: simulation before power supply

Table 1: comparison of parameters

SI No	Name	Specification	Details
1.	Battery	9V	It supplies power to the circuit.it is a leak proof battery.
2.	AUX cable (3.5MM)	3.5mm	It connected with smart phone and mp3 player.it transmit audio in stereo format.
3.	Resistor (100ohm)	100ohm	It is 100-ohm carbon film resistor, which offer lower noise and having better temperature stability.
4.	Mini speaker	-	It transforms audio signals from electrical signals.
5.	LED (2V)	2V	When an electric current is applied to this semiconductor device, it emits light.
6.	Solar panel	-	It produces electric energy by converting solar energy.

**4. Result & Analysis:** Li-Fi audio data transfer working in a very basic manner. Here one section of the device emits the light, acts as a transmitter, and the other section acts like receiver. Which is a solar Panel. When LED lights flicker towards the transmitter side the data transfers with the light ray in a binary code form. That can be produced various strings of 1 and 0.the on off function from the LED light leads to transfer this binary code towards

the receiver side. The speed of on off is very speed that cannot be seen in human eye. When the receiver receives the binary code. At the time data is transferred in wireless way.

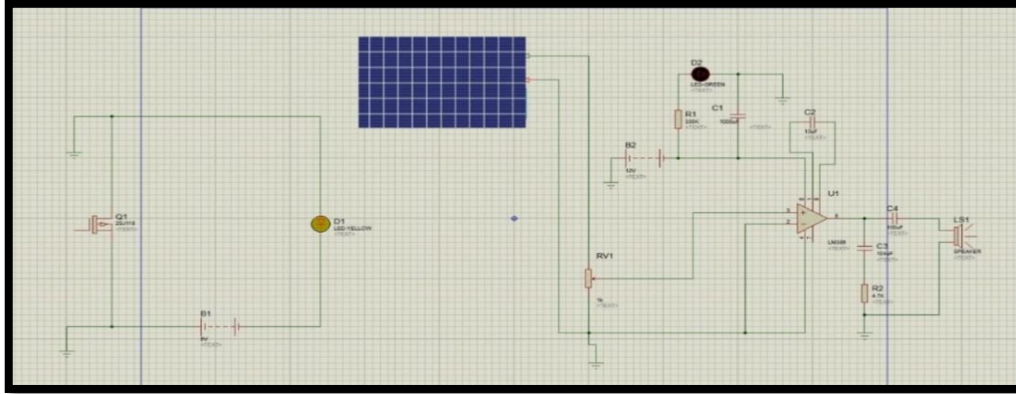


Figure 3: simulation after power supply

5. **Conclusion:** While it will take more time to execute this technology become commercially useable, it carries more future for create a new generation of wireless data transmission sector. This technology now being developed by a huge no of institute and businesses, and it has ability to stand against the issue of limited area of radio spectrum also slow and unsecure internet connection and data transfer .by applying this technology in our life, we can create a new generation safer faster and cleaner data transfer technology. Li-fi could the ability to provide high speed data and internet toward its consumer. Li-fi plays an important role to boosting the new technology in this era. Therefore, this technology will continue to develop, by the help of human. At the end of the period, LI-fi known as a fully developed wirelessly data and internet transfer technology.

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