



Transmission of Data in Form of Visible Light Using Li-Fi Technology

¹Prof. Ashwini F. Kokate, ²Pradip L. Atkari, ³Rohit S. Mahure, ⁴Jyoti B. Lanjewar

¹HOD, ^{2,3,4}Students, Department of Electrical Engineering, Madhukarrao Pandav College of Engineering Bhilewada, Bhandara, Maharashtra, India.

ABSTRACT

In this paper we will first explain what Light-Fidelity (Li-Fi) is and argue that it is a 5th generation (5G) technology. The peak transmission speed of 8 Gbps is displayed from a single light source and complete cellular networks based on Li-Fi have been created. We will discuss a number of misconceptions and explain the potential impact of this technology on many existing and emerging industries. We also discuss new applications that could unlock Li-Fi in the future. Li-Fi is a wireless communication system that uses light as a carrier signal instead of traditional radio frequencies like Wi-Fi. Li-Fi is a technology that uses light emitting diodes to transmit data wirelessly. Li-Fi is a form of Visual Light Communication (VLC). VLC uses the rapid pulse of light to transmit information that cannot be detected by the human eye wirelessly. This paper shows the function of Li-Fi by imitating a simple circuit which gave us the required output. Harold Haas, a German physicist at the University of Edinburgh, was the first to demonstrate Li-Fi technology.

Key words: Sensor, Li-Fi transmitter, Li-Fi receiver, Wi-Fi LED, VLC (visual light communication)

INTRODUCTION

Covid-19 is a long-awaited guest. Covid-19 is a contagious death caused by a newly discovered corona-virus. The 17th World Health Convention established September 17 as World Patient Safety Day to raise global awareness about health workers. This is linked to patient safety. Li-Fi stands for 'Light Fidelity'. It is a VLC (Visible Light Communication), technology developed by team of scientists including Dr. Gordon Povey, Prof. Harald Hass and Dr. Mostafa Afgani at University of Edinburgh Li-Fi is now part of Visible Light Communication (VLC) PAN IEEE802.15.7 Standard."



Fig. 1 Lifi

Li-Fi is typically implemented using white LED light bulbs”. These devices are normally used for illumination by Applying a constant current through the LED. Li-Fi is the term have been used to label the fast and cheap wireless communication system. The optical version of Wi-Fi is Li-Fi light-based Wi-Fi, which uses light instead of radio waves to transmit information.

Table -1 Comparison between LI-FI and WI-FI

S. No.	Parameters	Li-Fi	Wi-Fi
1	Speed For Data Transfer	Faster speed > 1Gbps	Speed around 150 mbps
2	Medium of Data Transfer	Use light as carrier	Use radio spectrum
3	Standard	IEEE 802.15.7	IEEE 802.11
4	Power Consumption	Low	High
5	Bandwidth	Unlimited	Limited
6	Cost	Cheaper	Expensive
7	Operating Frequency	Hundreds of Tera Hz	2.4 GHz

WORKING PRINCIPLE OF LI-FI

The operating concept of Li-Fi is very clear and simple if LED is ON, a digital signal 1 is transmitted, if it's OFF then a digital signal 0 is transmitted.

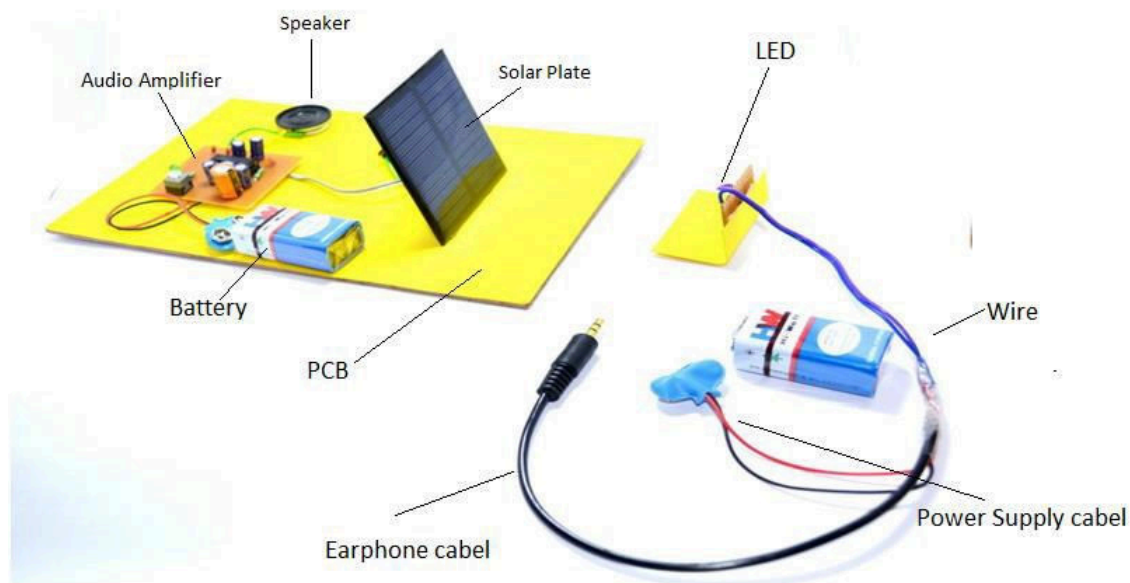


Fig. 2 Working of Li-Fi Technology

The Li-Fi operating theory is very simple: - If the LED is ON, a digital signal 1 is transmitted, if it's OFF a digital signal 0 is transmitted. A light emitter (LED) is present on the transmitter side and photo detector (light sensor) is present on the receiver side. It is this photo detector that records binary 1 and 0 by clicking ON and OFF lights. With this technology each and every LED light source will serve as a hub for data transmission.

APPLICATION OF LI-FI

- 1) Public Internet access using existing LED lighting.
- 2) Auto-piloted cars that communicate through their LED based headlights.
- 3) Contacting experts from around the world through the operation theater.

- 4) Since it only uses light, it can be used safely in areas or areas where the presence of radio waves poses a safety issue.

ADVANTAGES OF LI-FI

- 1) **Efficiency:** Efficient use of energy due to the use of LED illumination already in use for lighting purposes. Therefore, negligible additional power / energy will be required for data transmission.
- 2) **High Speed:** Technology uses bandwidth that is not currently used. Therefore, low interference, wide bandwidth and high-intensity output are its major data features.
- 3) **Availability:** Since light sources are available everywhere, availability is not an issue. So where there is light, there will be internet.
- 4) **Cost-effective:** This technology requires certain components for its operation. The technology also uses negligible extra energy for data transmission. Overall, the use of this technology is economical.
- 5) **Security:** As light cannot pass through opaque structures, LiFi Internet is only available to those in a limited area. This Internet cannot be blocked or misused outside the working area.
- 6) **Futuristic:** Due to the huge increase in the use of LED, this technology has great potential in the future. Overall, it is considered a sustainable model for Internet access because of its low cost and high efficiency.

LIMITATIONS OF LI-FI

- 1) Internet access is limited due to the presence of light source.
- 2) Interference of natural light (sunlight) and normal electric light can reduce the speed of data transmission.
- 3) Since light cannot pass through opaque objects, path barriers can affect data transmission.
- 4) It has a much lower range than Wi-Fi.
- 5) Not yet developed for mass scale adoption.

CONCLUSION

When this technology is applied, it is possible to use each bulb as a hotspot, which creates a safe environment. As radio waves are dangerous for living creatures and therefore pose a threat to birds, we try to minimize this complication by using light fidelity which works on visible light frequency and does not harm nature. Another advantage of Light Fidelity is that it reduces power consumption and transfers data at high data rates over which Wi-Fi is difficult to access. The use of this technology in the medical field speeds up the diagnosis and the Internet can be used with devices based on radio waves. The disadvantages of this technology are that it has a specific vision and the efficiency varies depending on the use of the bulb.

Therefore, the implementation of this technology can solve problems such as lack of radio-frequency bandwidth and even allow traditional radio-based wireless internet such as airplanes or hospitals.

REFERENCES

- [1]. H. Haas, Wireless data from every light bulb, TED Global, August 2011.
- [2]. H. Haas, L. Yin, Y. Wang, C. Chen, what is Li-Fi? IEEE J. Light Technol. 34 (6) (2016) 1533–1544.
- [3]. P.J. Winzer, D.T. Neilson, from scaling disparities to integrated parallelism a decathlon for a decade, IEEE J. Light Technol. 35(5) (2017) 1099–1115.
- [4]. Gopal S. Gundu, Studding Master in Computer Application from Institute of Management and Computer Studies (IMCOST) Affiliated to Mumbai University in the period year 2012-15.
- [5]. Sandeep R. Verma, Studding Master in Computer Application from Institute of Management and Computer Studies (IMCOST) Affiliated to Mumbai University in the period year 2012-15.