

# Li-Fi (Light Fidelity) A Unguided Future Technology

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**Abstract-** In these days fast internet and digital communication is a major requirement. One of the most important activities is transfer of information from one place to another, but the current wireless technologies (Wi-Fi) are not so much capable to provide the same speed for multiple devices at the same time. Wi-Fi works on radio waves. When the number of devices increases its speed decreases. In this Li-Fi is a better option because it is a fast and upcoming growing technology. In the present paper the writer have pointed on the working, applications and the limitations of using Li-Fi in communicating and transferring data.

## I. INTRODUCTION

In 2011 prof. Herald Haas introduced Li-Fi first time at Global Talk. The present technology of data transmission is has become old and slow. The latest wireless transmission technology Li-Fi will provide a better transmission of data between devices using light at higher speed. Li-Fi is VLC, visible light communication technology which is a modern wireless communication technology that empowers remote transmission of data using led light. With the use of this light bulbs can bring not only light but wireless connection at same time anywhere where LED's are used. Wi-Fi plays an efficient role in wireless data coverage within buildings, while using Li-Fi we will provide excellent density data coverage in particular location without any radio interference issues. Li-Fi provides better latency, performance, accessibility and security than Wi-Fi, and under laboratory conditions has even reached extreme speeds greater than 1 Gbps. **Li-Fi multiplies the speed and bandwidth of wifi, 3G and 4G.** Li-Fi technology only needs a light source with a chip to transmit an internet signal through light waves.

## II. WHAT IS LI-FI ?

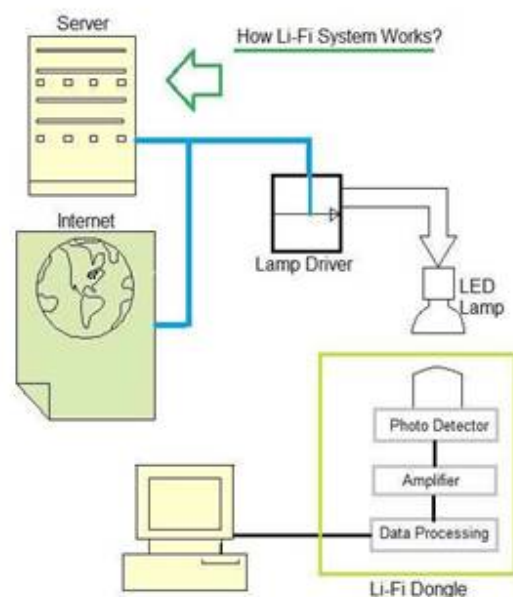
**It is a bidirectional wireless system that transmits data via LED or infrared light.** WiFi runs on Li-Fi, but the difference is that the WiFi used to transmit data with the use of radio frequency and the Li-Fi will transmit data with the use of light. Using light to transmit data allows Li-Fi to deliver a few

benefits such as working in areas vulnerable to electromagnetic interference like hospitals and aircraft cabins and working across higher bandwidth while offering higher transmission speed.

## HOW LI-FI WORKS

Li-Fi is a visible light communication system in which the internet transmit data without the use of wires at a very high speed. this system creates a LED light bulb to throw pulses of light that are unlocatable to the human eye and with the use of these pulses the data can be transferred from one reveiver to another. After that receiver collect the data and translate the transferred data.

This is conceptually similar to decoding Morse code but in a much faster rate – millions times a second. LiFi transmission speeds can go over 100 Gbps, 14 times faster than WiGig, also known as the world's fastest WiFi.



**III. ROLE OF LIFI IN TODAYS WORLD**

Li-Fi can transfigure the aeronautics industries because of its great potential. Mainly we have always a issues of bottleneck at airports and aircraft interiors, which stops people to use faultless data streaming and downloading .This system can be easily used in airline cabins because it does not interfere with radio frequency devices. The basic ideology behind this technology is that the data can be transferred through LED light by varying light intensities faster than what the human eye can perceive. This technology uses a section of the electromagnetic spectrum that’s still not greatly utilized-The Visible Spectrum, instead of Gigahertz radio waves for data transfer.Li-Fi is a secure, faster and safer medium which when put into action will successfully fill the gaps in wireless data transmission created by Wifi.We’re living in a time when technologies are proliferating in every sector and smart inventions are at an all-time high. The demand for wireless networks that can meet the never-ending need for data communication is growing exponentially. According to the Cisco Visual Networking Index, the demand for mobile communications is increasing at over 50% per year. Wireless communications have evolved incessantly corresponding to the needs and interests of today’s generation, but the available radio frequency spectrum is not enough to cater to the growing demand for wireless data. The spectrum crunch puts constraints on the increasing demand for global connectivity and high capacity leading to a data communication gap.

**Why Li-Fi or Visible Communication System?**

The frequency spectrum that is available in the atmosphere consists of many wave regions like X-rays, Gamma rays, U-V, IR, visible light rays, radio waves, etc. Any one of the above waves can be used in the upcoming communication technologies but why the Visible Light is preferred? The reason behind this is the easy availability and lesser harmful effects that occur due to these rays of light. VLC uses the visible light between 780 NM and 375 NM as medium which are less dangerous for high-power applications, and also humans can easily perceive it and protect themselves from the harmful effects whereas other wave regions have following shortcomings:

- Radio waves are expensive and less secure due to interference and possible interception etc.
- Gamma rays are harmful while handling due to their proven adverse effects on human health
- X-Rays have health issues, similar to Gamma Rays
- Ultraviolet Rays can also be dangerous for the human body when exposed continuously

- Infrared Rays due to high safety regulation, can only be used with low power.

Concluding, visible light from red to blue of the electromagnetic spectrum does not cause any harm to the mankind, provide larger bandwidth and also have a promising future in the communication field.

**IV. LI-FI VS WI-FI**

Sr. no	Bases	Li-Fi	Wi-Fi
1	Defination	It stands for light fidelity	It stand for wireless fidelity
2	Created by	It was created by prof.haraldhass in 2011.	It was invented by NCR corporation on 1991.
3	Operation	LI-Fi transmit data using light signals through led bulbs.	Wi-Fi transmit data using radio waves using wifi router.
4	Data transfer speed	Li-Fi transfer speed is 1 Gbps.	Wi-Fi transfer speed is 150 Mbps to 2 Gbps.
5	frequency	10,000 times radio frequency spectrum.	2.4Ghz, 4.9Ghzand 4Ghz.
6	coverage	Its coverage area is about 10 meters.	Its coverage area is upto 32 meters.

**Future Scope**

As light is everywhere and free to use, there is a great scope for the use and evolution of Li-Fi technology. If this technology matures, each Li-Fi Bulb can be used to transmit data. As the Li-Fi technology becomes popular, it will lead to a cleaner, greener, economical, and safer communication system. Although Li-Fi promises to solve issues such as, shortage of radio-frequency bandwidth and eliminates the disadvantages of radio communication technologies, but it is also associated with short range and the need of a light source. As such Li-Fi is not likely to replace Wi-Fi completely, but the use of two together i.e. Wi-Fi and Li-Fi can prove to improve quality of life.

**V. APPLICATIONS OF LI-FI**

**Under Water Communication System**

Information is transmitted from one point to another via modulation. Modulation, forming the basis of communication, is the process of transmission of low frequency data signal with high frequency carrier signal. As it could be understood from the description above, we need two signals for modulation process. These are data signal (voice, music, map, and video) to transmit and high frequency carrier

signal. For three reasons modulation is a necessity. First, low frequency data signal has not that much energy to travel far distances. Second, if low frequency data signal were not imposed on carrier signal, in other words if not modulated, the dimension of the antenna would be inefficiently long. It is because the dimension of the antenna is inversely proportional to frequency. Third, data signal bandwidth is 20 Hz-20 KHz and assuming the frequency range of amplitude modulation is 5-10 KHz, there could be a few stations established. For these causes modulation as basis of communication is a demanding tool needed to be used.

### Hospital

Increasingly, medical facilities are using remote examinations and even procedures. Li-Fi systems could offer a better system to transmit low latency, high volume data across networks. Besides providing a higher speed, light waves also have reduced effects on medical instruments. An example of this would be the possibility of wireless devices being used in MRIs similar radio sensitive procedures.

### Security

In a meeting room environment, the access area of each channel is the width of the light pool, and can be accessed by multiple users. Each user can receive higher data rates than would be the case for an equivalent Wi-Fi channel. In the Wi-Fi case, each user or group of users directly competes for access to bandwidth. The net result is that the more connections there are, the slower the download speeds are for all. By contrast, in the case of Li-Fi, with its greater number of available access points, each pool of light provides full channel data rates with fewer simultaneous users. The overall net benefit to each user is up to 1000 times greater speeds. In addition, and in contrast to radio waves, the light does not pass through the walls. Therefore, with minimal precautions to avoid leakage from windows, etc., security is fundamentally enhanced as compared with Wi-Fi.

### Indoor navigation

By identifying each light (for example, through the use of the widely used MAC codes used by data routers and computers) it is possible to provide a smart means of navigating through urban environments. The identification of each code would be linked to a specific location. For example, light received from the closest fixture can indicate to a mobile user their exact position as they travel along a corridor.

### Li-Fi and Cryptocurrency

Global Greenology, a privately owned worldwide manufacturing and design company specialising in environmentally friendly, energy-efficient building solutions, has developed a cryptocurrency for Li-Fi implementation. OWNII Coin is developed to oversee, develop, and design the physical infrastructure necessary to implement Li-Fi in the United States and developing nations abroad and is sold privately. Global Greenology states that the OWNII Coin will promote the creation of new internet infrastructure in the United States and beyond. It will also create numerous opportunities for employment, business ownership, and entrepreneurial endeavours selling equipment and services. OWNII creates wireless communication, that is faster, addresses issues with internet security, allows localisation due to small coverage area of Li-Fi access points used for precise asset tracking. Furthermore, providing ubiquitous high-speed wireless access that offers substantially higher data density (data rate per unit area) than RF through high bandwidth reuse.

### Li-Fi and Virtual Reality (AR)

Virtual reality (VR) refers to a computer-generated simulation in which a person can interact within an artificial three-dimensional environment using electronic devices, such as special goggles with a screen or gloves fitted with sensors. VR technologies are growing at a rapid rate. Quality VR requires users to have a speedy Internet connection. US military tests in the 90s showed that low quality video was a primary offender for why people get motion sickness when using VR headsets. Over the years, hardware manufacturers have done a great job in making sure VR kits are less likely to cause motion sickness. However, they can still get bogged down by latency and bandwidth issues they have little power over.

For VR devices, Li-Fi technology can provide very fast and constant data rates, low latency, and maximum user mobility. Li-Fi can also provide even greater bandwidth for VR devices.

### Li-Fi and Villages

The Li-Fi transmission of data, information and the internet by light thanks to renewable energy (solar) in rural areas. By installing LEDs and using their light spectrum, this broadband device can broadcast TV channels. "with this free internet, we want to allow young people who have left their villages to come back to participate in its economic development".

## VI. CONCLUSION

The possibilities are numerous and can be explored further. If this technology can be put into practical use, every bulb can be used something like a wi-fi hotspot to transmit wireless data and can be proceed towards the cleaner, greener, safer, brighter future. The concept of li-fi is currently attracting a great of interest, not least because it may offer a genuine and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless in internet, the airwaves are becoming increasingly clogged, making it more and more difficult to get a reliable , high-speed signal. This may solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals. One of the short comings however is that it only work in direct line of sight. A great change in daily life will happen if Li-Fi technology replaces Wi-Fi and other broadband networks.

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