

Li-Fi Technology

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Abstract: This modern Li-Fi (Light Fidelity) technology refers to 5 G Visible Light Communication systems that use light emitting diodes in a similar way to Wi-Fi as a medium to high speed communication. In the days when the Internet is a challenging area, people are searching for Wi-Fi hotspots. In wireless networking Li-Fi or New Life data connectivity is a great alternative to Wi-Fi. Li-Fi has a speed thousand times faster than Wi-Fi and provides safety as the visible light cannot pass through the walls. These technologies have put the future of connectivity not only greener but healthier and cheaper.

Keywords: Li-Fi, Wi-Fi, LED, D-Light (Data Light), Visible Light Communication (VLC).

I. INTRODUCTION

Li-Fi can be thought of simply as a light-based Wi-Fi. That is, it uses light to relay information, rather than radio waves. So, Li-Fi will use transceiver-fitted LED lamps instead of Wi-Fi modems that can light a room as well as send so receive information. Since simple light bulbs are used, an array of access points can technically exist. This device uses a part of the electromagnetic spectrum which is not yet commonly used-The Visible Spectrum. In reality, light has been a big part of our lives for millions and millions of years, and has no great ill impact. In addition, this range has 10,000 times more capacity available and, only based on the bulbs in use, it often multiplies up to 10,000 times more quality. Data can be encoded in the light by varying the rate at which the LEDs flicker to send different strings on and off For 1s, for 0s. The strength of the LEDs is so easily modulated That human eyes cannot detect, hence the performance appears constant. More sophisticated techniques could raise the VLC data rates dramatically. Teams at Oxford University and Edinburgh University focus on parallel data transmission using arrays of LEDs, in which each LED transmits a different data stream. Some groups use mixtures of red, green and blue LEDs to adjust the frequency of light, with each frequency encoding a different channel of data. Li-Fi has already reached blisteringly fast speeds in the lab, as it has been called. A typical white-light LED has been used by researchers at the Heinrich Hertz Institute in Berlin, Germany, to reach data levels of over 500 megabytes per second It can send data at 100 MB/s - faster than most UK wideband connections.

II. DESCRIPTION



Fig 1. Li-Fi Technology

Li-Fi is usually implemented on a downlink transmitter using white LED light bulbs. Such instruments are usually only used for illumination by the application of a steady current. However, the optical output can be made to vary at extremely high speeds by rapid and subtle current variations. In Li-Fi configuration this changing optical current property is used. The operating procedure is very basic, you transmit a digital 1 if the LED is on, if it is off you transmit a 0. The LEDs

can be turned on and off very easily, thereby providing pleasant data transmission opportunities. Therefore, all you need is some LEDs and a controller that encodes data into those LEDs. All one has to do is vary the rate at which the flicker on the LED depends on the data that we want to encode. In this process, more improvements can be made, such as using a variety of LEDs for parallel data transmission or using mixtures of red, green and blue LEDs to modify the light frequency with each frequency encoding a different data channel. These technologies pledge a theoretical speed of 10 Gbps, so you can download a full high-definition video in just 30 seconds.

Light is naturally secure and should be used in areas where contact with radio waves is often considered troublesome, for example in aircraft cabins or hospitals. Thus, visible light communication not only has the potential to solve the lack of spectrum space problem, but can also allow new applications. The visible light spectrum is unused, it is unregulated, and can be used at very high speeds for contact.

III. WORKING OF LI-FI

Signals from the VLC system operate by flipping the bulbs on and off within nanoseconds, so that human eyes cannot detect it. High visibility white LED acts as source of light, i.e. as source of transmission. The receiving element is a silicone photo-diode with good response to visible light.

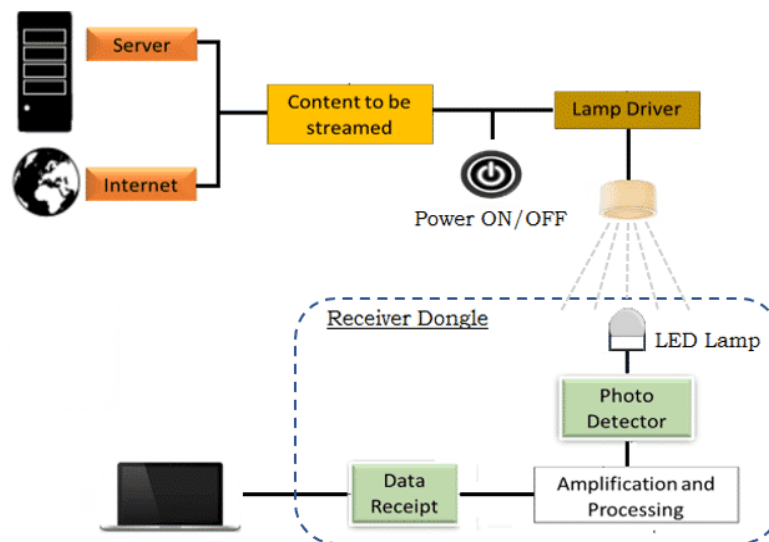


Fig 2. Working of Li-Fi

The LIFI product consists of 4 primary sub-assemblies:

- Bulb
- RF power amplifier circuit (PA)
- Printed circuit board (PCB)
- Enclosure

The LEDs are turned on and off to produce combined optical 1s and 0s strings. Data is encoded in the light to create a new data stream by adjusting the flickering rate of the LED which is used as the source. The LED output appears constant to the human eye due to the LED 's fast flickering rate. The data rate of VLC is improved by parallel transmission of data using a series of LEDs where each LED transmits a separate data stream.

Advantages:

- High Velocity
- Li-Fi use visible light instead of radio frequency signals
- Because this system does not deal with radio waves, integrated in medical equipment and hospitals, it can be conveniently used in areas where Wi-Fi, infrared, Wi-Fi and Internet are prohibited. Transferring medium for us in this manner would be most beneficial
- Safety is another advantage, it points out, since light does not penetrate walls
- In streets for traffic checking. Vehicles with LED-based headlights, LED-based backlights and vehicles can interact and prevent accidents through information sharing. The car can communicate with the traffic lights etc

Limitations:

- There are still some backdrops like this that can be communicated only when it can be well hopefully worked out in the line of sight or coming days I assume. There were a lot of early submissions, and some very good ones
- Although this technology sounds like a substitute for Wi-Fi, this high-speed data transmission network still has some disadvantages

IV. APPLICATION

- **Airways:** When we travel by airways, we are facing the issue in the news media that all the airways news is being carried out on the basis of radio waves. Li-fi is implemented to address the downside on radio ways.
- **Smarter Power Plants:** Wi-Fi is bad for sensitive areas and many other radiation sources. Like those power stations which surround it. But power plants need fast, interconnected data systems to track demand, grid integrity and core (at nuclear power plants) temperature. For a single power plant, the savings from careful control can add up to hundreds of thousands of dollars. For all areas of these sensitive locations, Li-Fi will provide safe, abundant connectivity. It will not only save money related to the technologies currently being introduced, but if they have not yet switched to LED lighting, the drain on the own reserves of a power plant will be lessened.
- **Lighting Point Used as Hotspot:** Any lighting system is conducted as a hotspot, which means that the lighting system, such as car lights, ceiling lights, street lamps, etc., can use visual illumination to spread Internet access. That helps us build low cost architecture for the hotspot. Hotspot is a restricted area in which a large number of computers access the internet link

V. COMPARISON OF LI-FI WITH OTHER TECHNOLOGY

LI-FI is one term used to describe the visible light networking technologies that relate to high-speed wireless networking. It acquired the name because of its similarity to WI-FI, using only light instead of radio. WI-FI is suitable for general wireless coverage in buildings and li-fi is perfect for high density wireless data coverage in restricted areas and for radio interference problems.

Table 1. Comparison of Li-Fi and Wi-Fi

Sl. No.	Li-Fi Technology	Wi-Fi Technology
1	The speed of data transfer is >1 GB/s	The speed will be around 150 mbps
2	Use light as the medium for data transfer	Use radio spectrum
3	The range of visible light is 10000 times more	Have less spectrum range when compared to VLC
4	It comes cheaper	It is expensive when compared to Li-Fi
5	Point-to-Point network topology	Point-to-Point network topology

The table below also contains the current wireless technologies, which can be used today to transfer data between devices, i.e. Wi-Fi, IrDA and Bluetooth.

Table 2. Comparison of different technologies

Technology	Speed
Wi-Fi – IEEE802.11n	150 Mbps
Bluetooth	3 Mbps
IrDA	4 Mbps
Wireless (future)	
WiGig	2 Gbps
Giga-IR	1 Gbps
Li-Fi	>1 Gbps

V. CONCLUSION

There are some possibilities, and these can be further explored. If its technology can be put to practical use, then each bulb can be used to transmit wireless data, such as a Wi-Fi hotspot, and we can move towards a cleaner, greener, a brighter and healthier future. At the moment, the idea of Li-Fi is attracting tremendous interest, not least because it can provide a legitimate and highly effective alternative to wireless based radio. With increasing numbers of people and their many devices accessing wireless Internet, the airwaves are becoming more and more obstructed, making it increasingly difficult to obtain a reliable, high-speed signal. It will resolve issues such as radio frequency spectrum shortages and also require internet where there is no access to traditional radio-based wireless such as aircraft or hospitals. One of the disadvantages, however, is that it works only in direct line of sight.

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