

Li-Fi(Light Fidelity) An Ultrafast Communication

¹B. Acharya

¹Electronic & Communication Engineering, D.G.I Greater Noida, India

balaramacharya.96@gmail.com

Abstract:

In Light fidelity the communication is performed through visible range of Electromagnetic radiation. In this technology light is emitted through light emitting diodes (LEDs) as a medium to deliver high-speed communication in the same way as Wi-Fi. Li-Fi is more efficient than Wi-Fi. The emphasis of this paper is the technology and merit of Li-Fi over Wi-Fi.

Keywords : Light Fidelity, VLC(visible Light Communication), LED, Wi-Fi, Bandwidth

Introduction:

Li-Fi is a wireless communications, using visible light. Professor Harald Hass is pioneer of this technology (Li-Fi). It makes use of the visible portion of the electromagnetic spectrum which is under-utilized. Li-Fi can be considered better than Wi-Fi. Visible Light Communication is preferable than other frequency. Since it is harmless, whereas Gamma Rays, X-Rays, Ultraviolet and I.R. are harmful for health. Generally we used 800-400 nm wavelength range of visible light to communicate the data. Nearly 100 Mbps data rate and proper multiplexing are possible by applying highly speed LEDs.

A light source having ability to be switched on and off very sharply i.e. time less than $1 \mu s$ is much useful to perform the communication purposes. Because this time interval is beyond

the human eye detection therefore light sources seems continuously on. To fulfil these requirements LEDs are more suitable to serve the purposes.

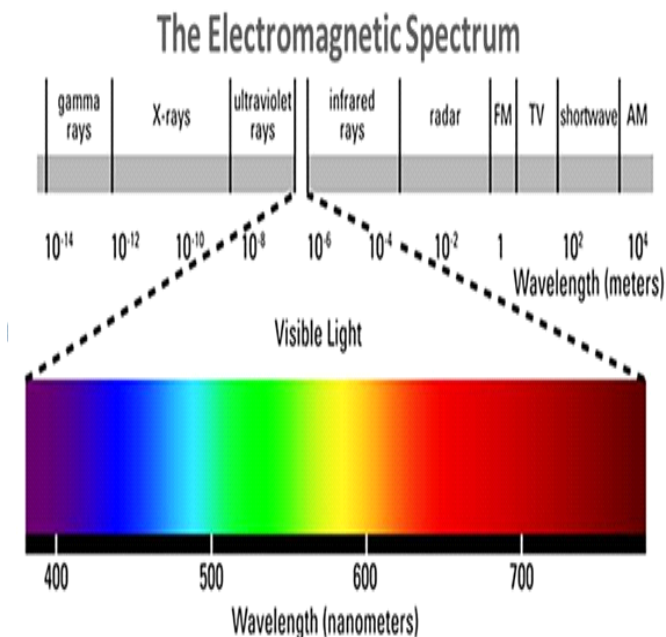


Fig-1: Spectrum of Electro Magnetic Radiation

Working Principle of Li-Fi:

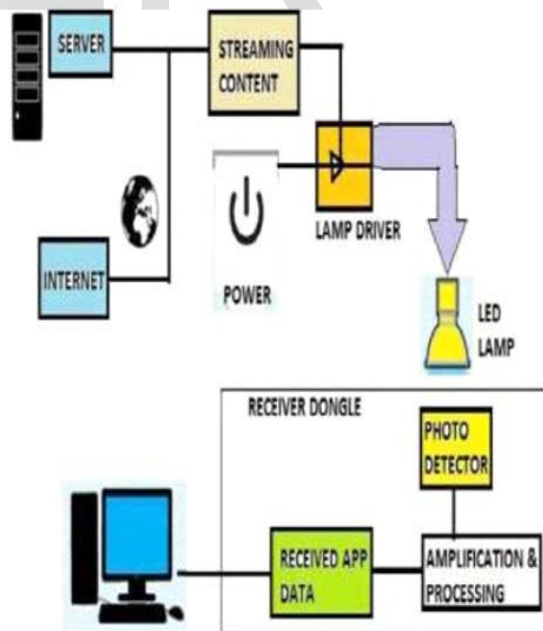


Fig-2: Block Diagram of Light Fidelity (Li-Fi)

The data transmission through LEDs can be performed using binary code. Since LEDs have invisible on-off characteristics. If the LEDs are on we use binary 1 and 0

when it will be off. So data entry is very simple using quicker on-off property of LEDs flicker. In this process the modulation is very high which is not detected by human eye. The received signal converted into original data by using a device known as photo detector. The process of using the fast pulse of light to send the information without wire referred as visible light communication (VLC). The term Li-Fi has much importance due to its high ability to compete with conventional Wi-Fi.

The Source of Light (LEDs):

The light emitting diode is a source of light having very fast rate to be on and off i.e. time interval is less than $1 \mu\text{s}$ which is not detected by human eye. In LEDs the energy is radiated as light due to spontaneous emission of radiation. LEDs made of different elements having the ability to radiate energy across a wide wavelength spectrum. Incandescent lamps may be replaced through LEDs due to its low voltage, rapid on and off switching and long durability. LEDs are made of different elements like Arsenic, Gallium and phosphorus produces the light of different colours i.e. Blue, Green, Yellow, orange and Red.

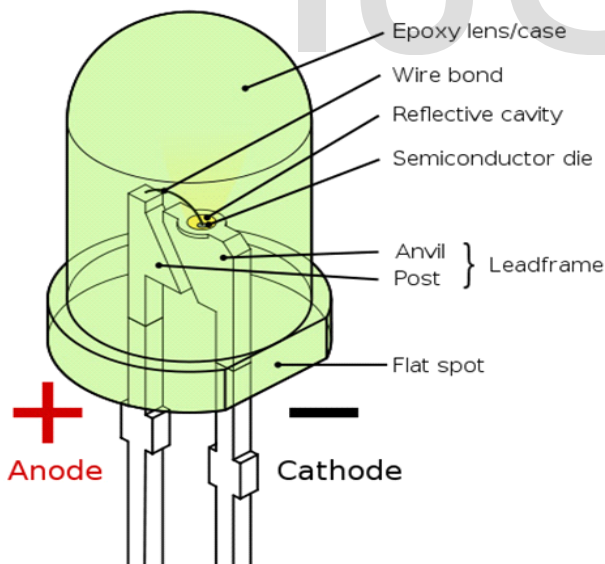


Fig 3: Light Emitting Diode (LED)

Advantage of Li-Fi

- **Capacity-** The visible light spectrum is 10000 times larger than Radio frequency spectrum.

- **Security-** Li-Fi is more secure than Wi-Fi due to its non-penetrating power through walls.
- **Efficiency-** Li-Fi is more efficient than Wi-Fi.
- **Transmission of Data-** Wi-Fi transmits data serially, whereas Li-Fi transmits data parallel.

Uses of Li-Fi

- **Intelligent transport system-** LED equipped vehicles can talk to each other and react faster when they are Li-Fi enabled.
- **Hospitals-** Since Wi-Fi is not useful in operating rooms in hospitals over radiation concerns but Li-Fi solve the problems.
- **For Sound environments-** The light used of visible range for communication purposes are not dangerous for environment but other transmission frequencies can be hazardous.
- **Oil and gas wells-** The testing and maintaining of gas wells can be done with better efficiency.
- **Indoor navigation-** The navigation of any hospital or building can be made through Li-Fi added LED lighting by users' smart phone.

Limitations of the Technology (Li-Fi):

Li-Fi has so many advantage over Wi-Fi in spite of that the technology also has their imitations and disadvantage. Some of them are listed below.

- Network coverage and reliability are major problems for visible light communication system.
- The uses of Wi-Fi and radio frequencies are continuing. The light bulbs are enable to provide data for remote area where several types of obstacles.

Conclusion:

Li-Fi technology offers the solution of several draw backs of WI-Fi. The Application of this technology has large area. It is harmless for environment if visible light are used to transmit the data for communication. For future applications the LEDs bulb will serve as Li-Fi hotspot.

Acknowledgment:

The author is thankful to HOD (ECE) for his constant inspiration and DGI for lab facility.

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