



## International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

# Wireless Communication through Light Emitting Diodes: A New Technology

Bhavithraj, Vinaya J Rai, Ashiq P.M, Bisharath Abdul Khader

Department of Computer Application (MCA), Sahyadri College of Engineering and Management, Adyar, Mangalore,  
Karnataka, India

**ABSTRACT:** Due to the exponential growth of communication technology novel approaches are required for effective and efficient transmission of data through communication channel. One of the solutions for this cause is transmission of data through Light Emitting Diodes. Transmission of data through light emitting diodes is one of the leading technology where light emitting diodes are used as service providers for wireless communication. In this article we are project the concept of Wireless Communication through Light Emitting Diodes (LED) known as Li-Fi Technology. Li-Fi stands for Light-Fidelity, propounded by the German physicist- Harald Haas, including Dr Gordon Povey and Dr Mostafa Afgani at the University Of Edinburgh [1] which enables data transmission by sending data through an LED bulb deviates in intensity and faster than radio waves. This technology supports for fast accessing of the data than the conventional technology. Wi-Fi is wireless networking technology that uses radio waves providing speed internet with in restricted area, where as Li-Fi provides high speed internet and it is faster than Wi-Fi for internet accesses. Li-Fi provides high competence, security, accessibility, convince. Li-Fi is capable of high speed communication with the data transmission of LED light. An idea anticipates a feature where data for gadgets will be transmitted through the light in a particular area.

**KEYWORDS:** Wireless Communication, Light-Fidelity, Li-Fi, Light Emitting Diodes (LED).

### I. INTRODUCTION

Transmitting a data from one area to another is one of the most important routine. The current wireless network which connect to internet is very slow hence many devices access the internet, because of the fixed bandwidth , there will be difficulty in accessing the data for all the devices .so the solution of the this problem is brought by the Li-Fi technology. This provides high speed access with high bandwidth and high data transmission capacity. Li-Fi is cheap wireless communication system uses visible light inspite of GHz radio waves. Li-Fi provides 10000 more frequency than radio waves, so level of transmission will be increased and supports multiple devices.

### II. CONSTRUCTION OF LI-FI SYSTEM

Li-Fi is a fast version of Wi-Fi. It is based on Visible Light Communication. Visible Light transmission is used for data communications. It uses the visible light which ranges from 400THz to 800THz [2,3] for data transmission as optical carrier for illumination. The main components under Li-Fi system are pointed below:

- a) White LED with high brightness acts as the transmission source.
- b) Silicon photodiode gives good response to visible light which acts as the receiving element.

Digital strings of different combinations of 1's and 0's can be generated switching ON and OFF of LED's. The data are encoded and decoded in the light by altering the flickering rate of LED. LED's have very high speed hence the communication rate is greater than 100Mbps.

There are four primary sub-assemblies in Li-Fi emitter system and are as follows:

- a) Bulb
- b) RF power amplifier circuits (PA)
- c) Printed circuit board (PCB)
- d) Enclosure

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Printed Circuit Board control the inputs and outputs of houses and lamps. The microcontroller is used to manage functionalities of lamps. Radio frequency signal are guided into electric field by generating to PA, then solid state is converted to plasma state with concentration of energy. The excessive light source is generated by plasma state. Figure (1).

The heart of the Li-Fi emitter is Bulb. The Dielectric materials that are embedded to the shield bulb are designed for Li-Fi. This design is more dependable than conventional light. The Dielectric material has two main purposes. It performs as a wave guide for the Radio frequency which is transmitted by and also acts as an electric field concentrator that provides energy in the bulb. The energy will heat the material in the bulb which converts to plasma. So plasma state would emit high intensity of light and spectrum.

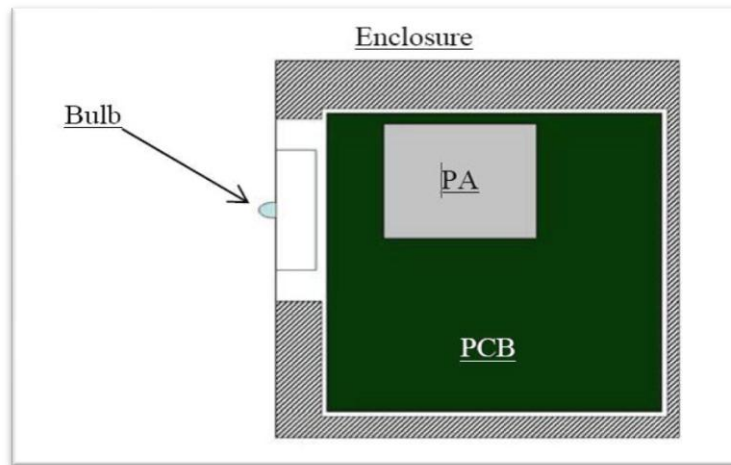


Figure 1 : Construction of LiFi

There are several advantages of this approach which provide high brightness, high cover quality, high color quality, high efficiency of the emitter which ranges from 150 lumens per watt or greater.

## WORKING OF LI-FI:

The Logic of this technology is very simple. The digital 1 is transmitted if the LED is ON and digital 0 is transmitted if LED is OFF. The high brightness LED's gives a very good opportunity for data transmission through light by switching the LED's ON and OFF rapidly.

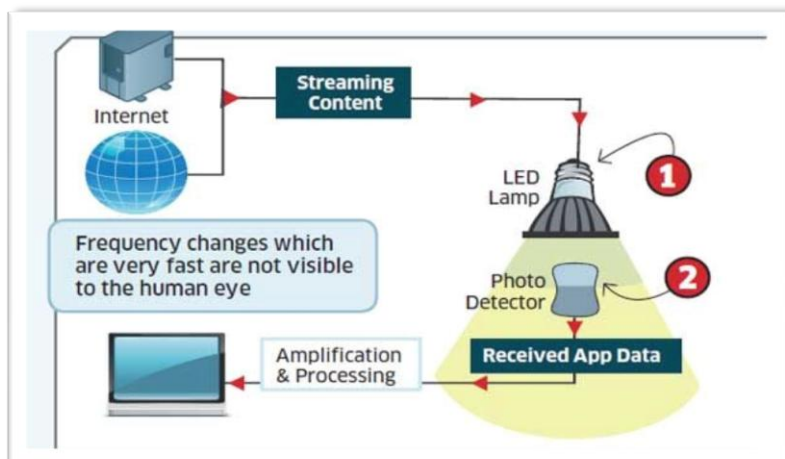


Figure 2 : Architecture of Li-Fi Technology.



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In LED, there is a light emitter on one end where as on other end there is a photo detector that that register a binary 1 when LED is put ON and binary 0 if LED is put OFF. To build up a data numerously flash the LED or use and array of LED with different color that obtains data rates of 100 Mbps. Light Emitting Diodes can be switched ON and OFF by flickering of light, when the flickering takes place the data are encoded in the light. The flickering of data is not recognized by the human eye.

## IV. COMPARISON OF LI-FI WITH OTHER TECHNOLOGY

The data transmission speed of Bluetooth is 3 Mbps whereas the data transmission speed of IrDA technology is 4Mbps, so the IrDA technology acquires more speed than the Bluetooth. In few of the circumstances these speed are not efficient in high data transmission, to overcome this problem Wi-Fi technology is used that provides the speed of 150 Mbps. Some circumstance Wi-Fi data transmission is insufficient; in such case Li-Fi Technology is used that contains more than 1Gbps.

## VI. ADVANTAGES OF LI-FI

The Li-Fi Technology has overcome many advantages from other technology.

- 1) Capacity: Li-Fi uses light which has 10000 times greater bandwidth than Radio waves. So capacity of Li-Fi is better than Radio waves.
- 2) Efficiency: As LED light consumes less energy hence it is more efficient.
- 3) Availability: Billions of light bulb are used everywhere, by replacing bulb lights to LED lights, which acts as data transmission medium as well as for the daily activities.
- 4) Security: Light waves will not penetrate through walls. Light waves from one area cannot be transferred to the other area. So the unauthorized access of data is not possible. Light waves are restricted within area.

### APPLICATIONS OF LI-FI

- a) Educational system: The latest technology Li-Fi provides high speed internet access. The advanced educational system such as video lecturing, virtual classroom needs high data transmission rate. The high speed data transmission that are needed for advanced educational systems are facilitated by Li-Fi
- b) Sub-marine application: Data transmission using internet or Wi-Fi cannot be accessed under water. But data transmission of Li-Fi can be accessed under water, so evolution of Li-Fi helps in data transfer in sub-marines.
- c) Air-craft application: It is impossible to use Wi-Fi and internet while flying because it distracts navigational system of an aircraft. The use of Li-Fi does not distract navigational system. So that it is possible to use high speed internet in aircrafts.
- d) Medical field: Radio waves are harmful for patient's health, so Robotical surgeries cannot be implemented since they use Wi-Fi. Li-Fi technology that uses light is not hazardous for health. Hence Robotical surgeries can be implemented using Li-Fi.

Working process of Li-Fi is shown in the following diagram [3].

## V. CONCLUSION

There are various possibilities for the transmission of data. If the technology becomes advisable then replacement of Wi-Fi to Li-Fi will lead to a great impact on data transmission. The concept of Li-Fi is attracting a lot to human eye because it offers an efficient and convenient alternative to wireless technology. As the population increases greater amount of data are accessed so the Traditional Wi-Fi will lag behind to provide high speed signal, this enables a bright chance to replace the traditional Wi-Fi. This concept also supports in shortage in bandwidth of Radio frequency. Li-Fi is the on growing and emerging technology which acts as competent for several developing and invented technologies. Hence Li-Fi can be implemented in future application and extended to different platforms.

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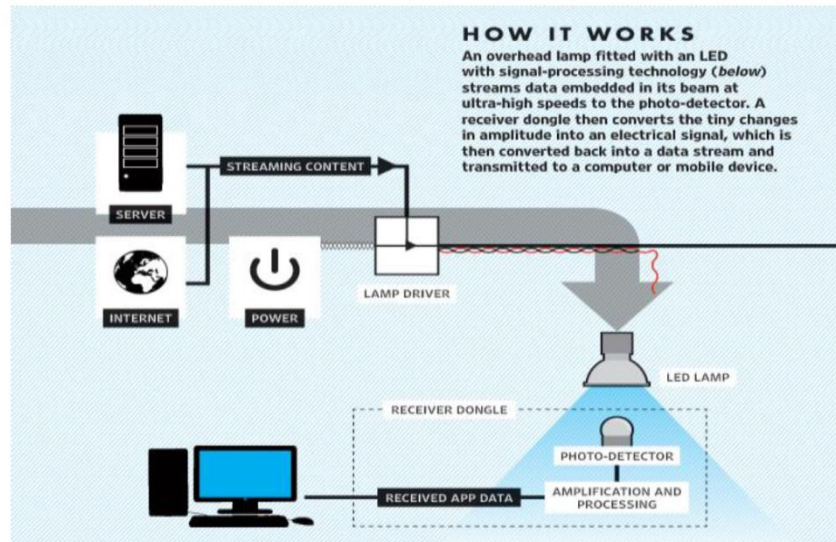


Figure 3: Working process of Li-Fi

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