

## An analysis of Li-Fi technology

**ABSTRACT-** Nowadays, finding Wi-Fi hotspots is really important because internet access has become so popular. Professor Harald Hass of the University of Edinburgh created the Li-fi or Light Fidelity technology. This is the latest technology in present day communication system which makes the use of LEDs, Light Emitting Diodes that helps in the transmission of data much more faster and flexible than the data that can be transmitted through Wi-Fi. It is essentially a 5G visible light communication system that works similarly to Wi-Fi by using light emitting diodes as a medium for high-speed communication.

### I. INTRODUCTION

Now-a-days, internet has become a major demand people are in search of Wi-Fi hot spots. Li-fi or Light Fidelity was invented by professor Harald Hass of university of Edinburgh. This is the latest technology in present day communication system which makes the use of LEDs, Light

Emitting Diodes that helps in the transmission of data much more faster and flexible than the data that can be transmitted through Wi-Fi. It is basically a 5G technology of visible light communication system which utilizes light emitting diodes as a medium of high speed communication in similar manner as Wi-Fi.



Fig(1).Basic Concept

### II. DESIGN of Li-Fi

Li-Fi architecture consists of a number of LED bulbs or lamps including many wireless devices such as Mobile Phones, Laptops and PDA. The following factors should be taken into concern while designing Li-Fi:

1. Presence of light.
2. Line of sight (LOS).
3. For better performance use fluorescent light and LED.
4. A photo detector received data.

Hence all that is required is some LEDs and a

controller that will code data into those LED switch

### III. IMPLEMENTATION of Li-Fi

Li-Fi is typically implemented using white LED light bulbs at the downlink transmitter. The LEDs are used for illumination only on applying a constant current to them. However, by fast and subtle variations of the current, the optical output can be made to vary at extremely high speeds. This very property of optical current is used in Li-Fi technology setup. It's operation is very simple as when the LED is on then a logic "1" is transmitted and when the LED is off then a logic "0" is

transmitted. This so happens at a very fast rate flickering of LED which is not visible to the human eye. Further enhancements can be made in this method, like using an array of LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to alter the light's frequency with

each frequency encoding a different data channel. Such advancements promise a theoretical speed of 10Gbps – meaning one can download a full high-definition film in just 30 seconds.

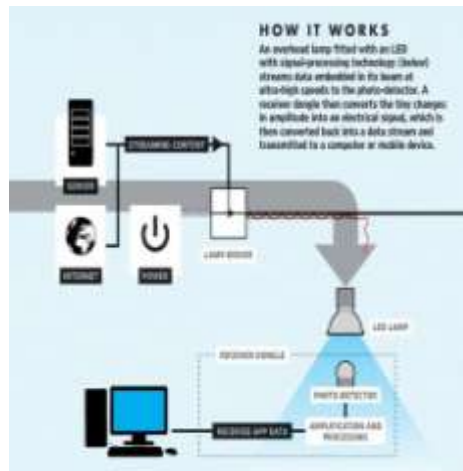


Fig (2): Implementation of Li-Fi

Implementation of Li-Fi given in the figure. In figure a internet connection is connected to the lamp driver. A switch with lamp driver and LED lamp also connected to this lamp driver through fiber optic cable. Now a receiving device, photo detector is used for receivesignal and then to perform further processing, this device is then connected to PC's or Laptop's LAN port. On one end all the data will be streamed to a lamp driver when the LED is switched on the microchip converts the digital data or the logic data in light form. The light detector receives the light signal and then convert it again into the original digital form. Hence we can retrieve the data or the information by using a simple circuitry of Li-Fi.

#### IV. VISIBLE LIGHT COMMUNICATION

Earlier, the radio waves were used but they were expensive and less secure. Infrared, can only be used with low power as for the sake of eye safety. Gamma rays cannot be used as they can prove to be dangerous. Ultraviolet light is good for place which is free from humans otherwise can be very harmful to the humans. Since visible light has no harmful effects, it can be safe to use and is also having a larger bandwidth. VLC is a data communication medium, which uses visible light in the range of 400THz to 800THz as optical carrier for data transmission and illumination.

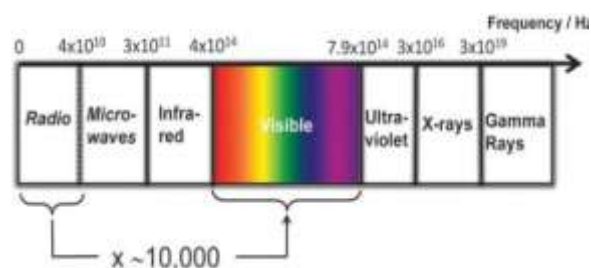


Fig (3): Electromagnetic Spectrum of Light.

#### V. APPLICATIONS

With a wide use of data transmission these days, Li-Fi has proved to be more advantageous than the present day technology of Wi-Fi. There are many fields where Wi-Fi and many technologies

have failed but Li-Fi has proved its excellence.

##### Underwater Communication

To use radio frequency in underwater communication can be impractical due to strong

signal absorption in water. Li-Fi provides an undue advantage in this case.

## VI. REPLACEMENT FOR OTHER TECHNOLOGIES

This technology doesn't use the radio frequency so it can be used in the places where the technologies like Bluetooth, Infrared, Wi-Fi etc. are banned. Li-Fi provides a best replacement for such technologies.

It has various benefits such as:

### Spectrum Relief:

With the increase of cell phone users, the available bandwidth is insufficient and can lead to over loaded condition. This problem can be solved by Li-Fi which uses the visible spectrum for communication.

### Mobile Connectivity:

Various devices such as Laptops, Mobile Phones, Tablets and other devices can be interconnected directly by using Li-Fi. It gives very high data rates and also provide security.

### Hazardous Environments:

Li-Fi is a safe alternative as compared to radio waves as in radio waves the electromagnetic interference takes place in environments such as mines and petrochemical plants.

- 1 A very wide spectrum of operation over the visible range of electromagnetic spectrum.
- 2 Extremely high color fidelity.
- 3 Secure access.
- 4 Easy terminal management.
- 5 Instant start up time

So, in a nutshell Li-Fi technology is far better than the current technology and can be used in those areas where other technologies fail.

## VII. FEATURES

### Bandwidth:

The visible light spectrum is plentiful, much more than RF and also is free to use.

### Data Density:

Li-Fi can achieve 1000 times the data density of Wi-Fi, as visible light can be well contained in the light illumination but in case of RF it suffers from interference.

### High Speed:

A very high speed of data access can be achieved from Li-Fi as it is free from interference and also is having a very large bandwidth.

## VIII. CONCLUSION

With the ongoing increase in the cellular networks, the newest technology of Li-Fi has proven to be a milestone in communication systems. It uses the visible spectrum of light which is far better than the RF as it is prone to interference. With the use of LEDs the information can be transmitted at very high rates with just the simple turning on and off of the LEDs. This technology is not only free to use but also provides a safe and secure access.

## REFERENCES

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