

## A Review of Li-Fi Network Technology

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**Abstract:** The development and usage of growing gadgets LED to the advancement in Wi - Fi technology provide us a new light- fidelity technology(Li - Fi). This technology makes use of LED light helps in the transmission of data transmitted through Wi - Fi. Light-fidelity is a branch of optical wireless communication system which is an emerging technology. Because of that by using visible light as transmission medium, it provides a wireless indoor communication. First of all, Dr. Herald Haas, professor of mobile communication, University of Edinburgh School of engineering, publicly demonstrate the Li - Fi, a method of visible light communication (VLC). Li-fi is transfer of data through light by taking out of fiber optics and sending data through LED light.

**Keyword:** Li- Fi, Wi - Fi, LED light.

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### I. Introduction

Demand for Wireless data is increasing day by day which is escalating the congestion in radio-spectrum. In present scenario the bandwidth capacity which is available is finite and is not capable enough to sustain with the constantly increasing demand of wireless data. Li - Fi is a label for wireless communication system which is used to describe visible light technology applied to high speed wireless communication. The term Li – Fi (just similar to Wi-Fi, using light instead of radio-waves) first described by German physical Professor Herald Hass in 2011 in TED Global talk on visible light communication. The wireless- fidelity has been used from almost years to provide the internet services to all the required places right from home to humungous organization. But it has limited bandwidth about of 54-100mbps. It is becoming intricate to transfer to the user flow less due to high definition video and audios available for the viewers. The problem of speed and consistency even doubles when support is to be given to multiple devices because of splitting up of bandwidth between devices. The infrastructure consistency of Wi –Fi is its easy and simple to set up network but threatening part is to provide security. To over come technological boundaries of Wi – Fi, a new paradigm is Li – Fi i.e. Light fidelity network system. It is an emerging technology with which using visible light communication (VLC) for high speed wireless coined by Prof. Herald Hass, a scientist to develop this technology with Dr. Gordon Povey and Dr. Mostafa Afgani team at Edinburgh University. He uses the white LED light bulbs to transmit the information as well as fulfilling the illumination purposes. Through fast and slight variations of current which applied to LED light the optical out put can be made to vary at very high speed. The variation caused in the current which passed to LED, will carry the data at high speed and can not be seen by the necked eye. In simple language, Li – Fi can be thought of as a light based Wi – Fi. Li-Fi would be used transceiver- fitted LED lamps instead of Wi-Fi modems that can light a room as well as transmit and information i.e. simply a technically LED can be use any number of access points.

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## II. Work Done

### Principal of Li –Fi Network

The heart of Li – Fi network technology is high source to brightness be appear continuously. This LED's invisible on light emitting diodes can be switch on and of activity is enable a kind of data transmission faster since operating speed using binary of codes. The modulation is so fast that can not notice by human eye. This device receives the signals and converts it into original data. This method of using rapid pulse of light to transmit the information wirelessly and technically offered to as visible light communication (VLC) though its potential to complete with conventional light. The frequency of radio waves used in Wi-Fi is 300GHz to 3.0 KHz. Whereas in Li- Fi, a visible light spectrum wavelength is of 450 nm – 760nm, so it is called VLC.

### Merits of Li-Fi Network

- It is high speed, as high as 500mbps or 30GB per minute and uses light rather than radio frequency signals.
- Visible light communication (VLC) can be used safely in aircraft.
- It integrated into medical devices and in hospitals as this technology does not deal with radio so it can easily used in such places where Blue Tooth, Infra red, Wi –Fi and internet are banned. In this way it will be most useful transferring medium for us. It can be used under water as in sea where Wi – Fi does not work.
- Li – Fi may solve issues such as the shortage of radio frequency bandwidth.
- The network security is another benefit, since light does not penetrate through walls.
- By implanting the technology worldwide every street lamps would be a free access point and visible light spectrum has 10,000 time broad spectrum in comparison to radio frequency in Wi – Fi system.

## III. Applications

Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. Since light is the major source for transmission in this technology, it is very advantageous in various fields. Hence the future applications of the Li-Fi can be predicted and extended to different platforms like education fields, medical fields, industrial areas and many other fields.

### 1. Smart Lightning

Various types of controlling can also be done by using this concept. In all energy consumption and writing incorporated will also be reduced as lights are already on for illumination, so no additional energy is required for data transmission [2, 3]. Its use can be extended in Projection Display System. Lamp technology which is electrode free using Li – Fi has been created for Projection Display application [4].

### 2. Underwater Communications

For short distances underwater visible light can support high speed data work. This could enable the drivers and underwater vehicles to pass voice messages to each other [5]. In such systems, microphone is installed in the LED light. The voice from a diver will be picked up with that microphone and will be sent to other diver over the light. The second diver will receive the light, accept the audio signal from the light and send acknowledgement to the other diver, the voice through a bone-conductive speaker. This underwater communication technology will make scuba diving not only more enjoyable but also safe and more secure. In 2008, Nakagawa Laboratories based in Tokyo demonstrated underwater visible communication technology for scuba divers.

**3. It Could Keep You Informed and Save Life:** Say you are traveling on a road and there is some news about the disasters so, on every street light we might come to know about the warning with the help of this technology.

**4. Medical and Analytical Applications:** In medical science, it is very useful to solve the solution such as Lambda XL is the new microscopy analysis of light source showcased y Sutter instrument. Earlier xenon HID (High Intensity Discharge) light source were used which has been redesigned using the Li – Fi light source [6]. It is very useful for high speed fluorescence microscopy analysis. Using VLC in hospitals and healthcare will be highly advantageous as mobile phones and Wi – Fi obstructed in some parts of hospitals especially near MRI scanners and in operation theaters.

**5. In Traffic Signals:** It is very helpful and can be used which will communicate with the LED light. It is a wacky and number of accidents that can be prevented.

#### **IV. Limitations**

In spite of several advantage of Li-Fi network over Wi-Fi, the technology appears, suffers from several limitations.

1. This technology may not be functional, if LED gets blocked by any obstacles [7]. and
2. There may be some adverse radiation effect on health of animals as well as human beings due to LED radiations.

#### **V. 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 we will proceed toward the cleaner, greener, safer and brighter future. The concept of Li-Fi is currently attracting a great deal 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 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 one of the short comings however is that it only work in direct line of sight.

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