

# Li-Fi Gets Ready To Compete with Wi-Fi

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**Abstract--** Now a day's many people are using internet to accomplish their task through wired or wireless network. As number of users get increased in wireless network speed decreases proportionally. It is often frustrating when the slow speed of network leads to limited connectivity and long processing hours while using wireless.

What if we can use other alternatives than Radio waves to surf the internet? Radio wave seems to be fully oppressed and other spectrum needed to be explored.

In this direction, Dr Harold Haas, a German physicist proposed an idea called "Data through Illumination" in which he used fiber optics to send data through LED light bulb. The idea is similar as of infrared remote controls but far more powerful. It's the same idea as infrared remote controls but far more powerful. It is called D-LIGHT, can produce data rates faster than 10 megabits per second, which is speedier than average broadband connection. Hence a future can be envisioned having light as transmitting medium to laptops, smart phones and PDAs(Personal Digital Assitants).

**Keywords --** Wireless-Fidelity (Wi-Fi), Light-Fidelity (Li-Fi), Light Emitting Diode (LED), Line of Sight (Los), Visible Light Communication (VLC).

## I. INTRODUCTION

Li-Fi basically known as "Light Fidelity" is an outcome of twenty first century. Li-Fi is a VLC, visible light communication technology, developed by the team of scientists at the University of Edinburg and deals with transfer of data through illumination.

HAROLD HASS, who is considered to be the father of Li-Fi from, says that the heart of this technology lies in the intensity and the potential of the light emitting diodes (LEDs). The major reason which lead the modern man through this invention is that the confinement of Wi-Fi to comparatively small distance. As there are more and more devices coming up day-by-day the signals are being blocked due to heavy traffic, there arises a need for an error free transmission technology. And the solution to this problem was the Li-Fi technology.

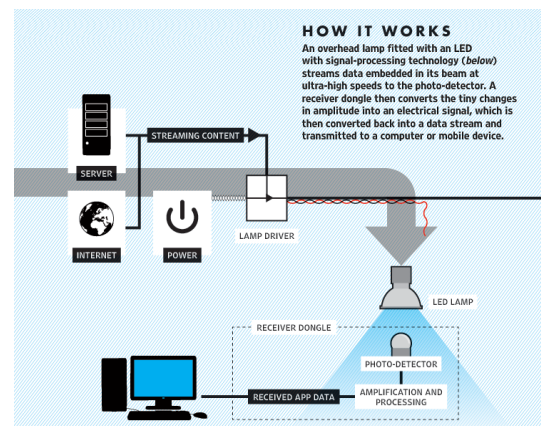
## II. WORKING TECHNOLOGY

The operation procedure is very simple- if the LED is on you transmit a digital 1, if it is off you transmit a 0. The LED can be switched on and off very quickly hence providing nice opportunities to transmit data. Hence all that is required is some LED and a controller that code data into those LEDs flicker depending upon the data we want to encode. The more LEDs in your lamp, the more data it can process.



Li-Fi architecture consist number of LED bulbs or lamps, many wireless devices such as Mobile Phones, Laptops etc. Important factors we should consider while designing Li-Fi are:

1. Presence of Light
2. Line of Sight (Los)
3. For better performance use fluorescent light & LED



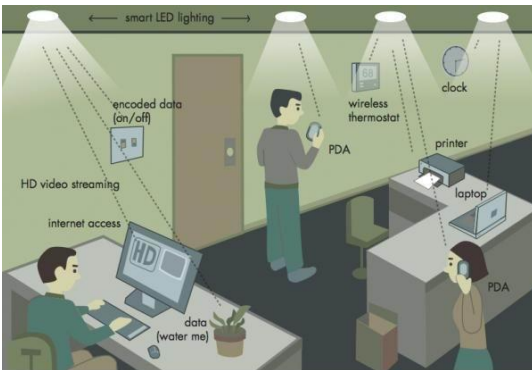
More sophisticated techniques could increase VLC data rates. Teams at the University of Oxford and the University of Edinburg are focusing on parallel data transmission using group of LEDs, where each LED transmits a different data stream. Other groups are using mixtures of red, green and blue LEDs to alter the lights frequency.

## III. COMPARISONS BETWEEN LI-FI AND WI-FI

LI-FI is a term of one used to describe visible light communication technology applied to high speed wireless communication. It acquired this name due to the similarity to Wi-Fi, only difference is that it uses light. Wi-Fi is good for general wireless coverage within buildings, and Li-Fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues, so the two technologies can be considered complimentary.

How it is different? Li-Fi technology is based on

LEDs for the transfer of data. The transfer of the data can be with the help of all kinds of light. We no more need to be in a region that is Wi-Fi enabled to have access to the internet. We can simply stand under any form of light source and surf the internet.



#### IV. ADVANTAGES OF LI-FI

- A. A free band that does not need license.
- B. High installment cost but very low maintenance cost.
- C. Cheaper than Wi-Fi.
- D. Theoretical speed up to 1 GB per second: Less time & energy consumption.
- E. No more monthly broadband bills.
- F. Lower electricity costs.
- G. Longevity of LED bulb: saves money.
- H. Light doesn't penetrate through walls: secured access.

#### V. DISADVANTAGES OF LI FI:

- A. Light can't pass through objects.
- B. High installation cost of the VLC systems.
- C. Interferences from external light sources like sun, light, other bulbs, opaque materials.

#### VI. LI-FI- A GREEN ENERGY INITIATIVE

Green Element finds one of the biggest attractions of Li-Fi is the energy saving credentials of LED technology:

- A. 19% of global electricity is used for lighting
- B. 30 billion light bulbs are in use worldwide
- C. smart-sensing integrated into LED low-energy bulbs is incomparably 'kind' to the environment

We constantly improve our innovations in lighting to respond to environmental challenges and help addressing issues such as energy usage and resources. LED lamps offer significant environmental benefits due to high energy savings and less number of lamps needed over time.

#### VII. APPLICATIONS OF LI-FI

Applications of Li-Fi can extend in the areas where Wi-Fi technology lacks its presence like medical technology, power plants and various other areas. Some of the future applications of Li-Fi are as follows:

##### A. Education systems

Li-Fi is the latest technology that can provide fastest speed internet access. So, it can replace Wi-Fi at educational institutions and at companies so that all the people can make use of Li-Fi with the same speed intended in a particular area.

##### B. Medical Applications

Operation theatres (OTs) do not allow Wi-Fi due to radiation concerns. Wi-Fi usage at hospitals interferes with the mobile and pc which blocks the signals for monitoring equipments. So, it may be hazardous to the patient's health. To overcome this Li-Fi can be used to accessing internet and to control medical equipments.

##### C. Airlines

Airline Wi-Fi wants captive audience to pay for the "service" of dial up on the plane. And also they are very expensive. Li-Fi could easily introduce speed to each passengers reading light. It would be interruption free to and from other wireless signals on the board.

##### D. Power Plants

Wi-Fi and many other radiation or radio waves are bad for sensitive areas like those of power plants especially the atomic power plants. Nuclear power plants need fast inter-connected data systems to monitor things like demand, grid integrity and core temperature. Li-Fi could offer safe connectivity for all areas of these sensitive locations. This would be cost effective.

##### E. Undersea working

Underwater Rovers use long cables to supply their power and allow them to receive signals from their pilots above. ROVs work efficiently until unless they got stuck somewhere or if the search area is huge. If made wireless and replaced with then they would be free to explore more.

##### F. Information Delegation

We can use L-Fi technology in subway stations, tunnels and other dangerous places for most emergency communications, pose no obstruction and could opt to provide cheap high-speed Web access to every street corner.

##### G. Various Other Areas

Can be used effectively in the places where it is difficult to lay the optical fiber cable. In traffic signals Li-Fi can be used to communicate with the

LED lights of the cars. All of the street lamps can be replaced with Li-Fi lamps to transfer data. It can be used in petroleum or chemical as well as in nuclear plants where other transmission or frequencies could be hazardous.

#### VIII. CONCLUSION:

Possibilities for future utilization are abundant. Every light sources can be converted into Li-Fi signal receptor to transfer data and we could proceed toward the cleaner, safer, greener and brighter future. As we know that the airways are getting blocked day by day Li-Fi can offer a very efficient alternative. The concept of Li-Fi is currently attracting a great deal of people, not least because it may offer a genuine and very efficient alternative to radio-based wireless technology. This is the technology that could start to touch every aspect of human life within a decade. Every

light sources in homes and offices could potentially be a Li-Fi within 20 years. When this technology becomes feasible like the Wi-Fi, then our life will be awesome on our Earth.

There are no dead ends to technology and science. Now both visible light and radio waves can be used simultaneously to transfer data and signals.

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