Emerging Technology Li-Fi over Wi-Fi

S. Vinay Kumar, K. Sudhakar, L. Sudha Rani

Abstract: ***Now a day's Wi-Fi is the most used technology by everyone, but there is an emerging technology Li-Fi, or light fidelity, refers to visible light communication systems using light from light-emitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication in a similar manner as Wi-Fi. Li-Fi can be used to off-load data from existing Wi-Fi networks to provide capacity for the greater downlink demand as complementary to the existing wireless or wired network infrastructure. Li-Fi could lead to the Internet of Things, which is everything electronic being connected to the internet, with the LED lights on the electronics being used as internet access points.The Li-Fi market is projected to have a compound annual growth rate of 82% from 2013 to 2018 and to be worth over $6 billion per year by 2018.***

Visible light communications (VLC) signals work by switching bulbs on and off within nanoseconds, which is too quickly to be noticed by the human eye. Although Li-Fi bulbs would have to be kept on to transmit data, the bulbs could be dimmed to the point that they were not visible to humans and yet still functional. The light waves cannot penetrate walls which makes a much shorter range, though more secure from hacking, relative to Wi-Fi. Direct line of sight isn't necessary for Li-Fi to transmit signal and light reflected off of the walls can achieve 70 Mbps.

History: Professor Herald Haas, from the University of Edinburgh in the UK, is widely recognized as the original founder of Li-Fi. He coined the term Li-Fi and is Chair of Mobile Communications at the University of Edinburgh and co-founder of pure LiFi. VLC technology was exhibited in 2012 using Li-Fi. By August 2013, data rates of over 1.6 Gbps were demonstrated over a single color LED. In September 2013, a press release said that Li-Fi, or VLC systems in general, do not require line-of-sight conditions. In October 2013, it was reported Chinese manufacturers were working on Li-Fi development kits.

Keywords: VLC(Visible Light Communication) LED(Light Emitting Diode),Li-Fi(Light Fidelity)

I. INTRODUCTION

Many Computers can be connected to the internet through Wi-Fi but there are some drawbacks over Wi-Fi to reduce the drawbacks the latest technology or the emerging technology that is Li-Fi (Light Fidelity). Four computers can be connected to internet through one watt LED bulb using light as a carrier instead of traditional radio frequencies, as in Wi-Fi, Under the new discovery dubbed as 'Li-Fi', a light bulb with embedded microchips can produce data rates as fast as 150 megabits per second, which is speedier than the average broadband connection.

The term Li-Fi was coined by Herald Haas from the University of Edinburgh in the UK and refers to a type of visible light communication technology that delivers a networked, mobile, high-speed communication solution in a similar manner as Wi-Fi.

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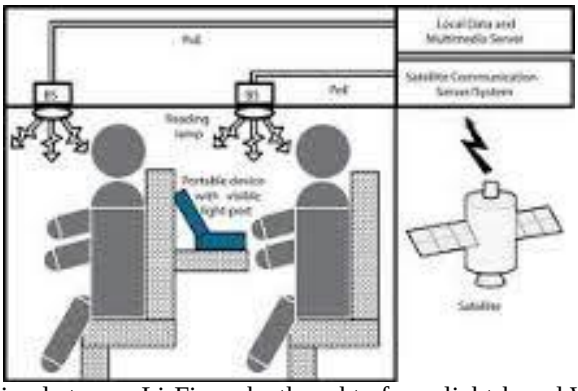


In simple terms, Li-Fi can be thought of as a light-based Wi-Fi. That is, it uses light instead of radio waves to transmit information. And instead of Wi-Fi modems, Li-Fi would use transceiver-fitted LED lamps that can light a room as well as transmit and receive information. Since simple light bulbs are used, there can technically be any number of access points.

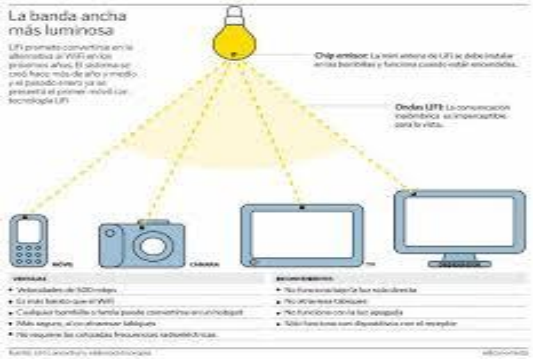
This technology uses a part of the electromagnetic spectrum that is still not greatly utilized- The Visible Spectrum. Light is in fact very much part of our lives for millions and millions of years and does not have any major ill effect. Moreover there is 10,000 times more space available in this spectrum and just counting on the bulbs in use, it also multiplies to 10,000 times more availability as an infrastructure, globally.

It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s. The LED intensity is modulated so rapidly that human eyes cannot notice, so the output appears constant.

More sophisticated techniques could dramatically increase VLC data rates. Teams at the University of Oxford and the University of Edinburgh are focusing on parallel data transmission using arrays of LEDs, where each LED transmits a different data stream. Other groups are using mixtures of red, green and blue LEDs to alter the light's frequency, with each frequency encoding a different data channel.

Li-Fi, as it has been dubbed, has already achieved blisteringly high speeds in the lab. Researchers at the Heinrich Hertz Institute in Berlin, Germany, have reached data rates of over 500 megabytes per second using a standard white-light LED. Haas has set up a spin-off firm to sell a consumer VLC transmitter that is due for launch next year. It is capable of transmitting data at 100 MB/s - faster than most UK broadband connections.

LIFI is a new class of high intensity light source of solid state design bringing clean lighting solutions to general and specialty lighting. With energy efficiency, long useful lifetime, full spectrum and dimming, LIFI lighting applications work better compared to conventional approaches. This technology brief describes the general construction of LIFI lighting systems and the basic technology building blocks behind their function.



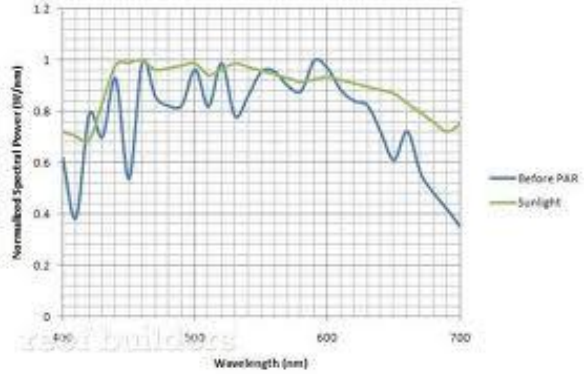


Fig: Represents the Wavelength of LED

II. HOW IT WORKS

1. Lifi Construction

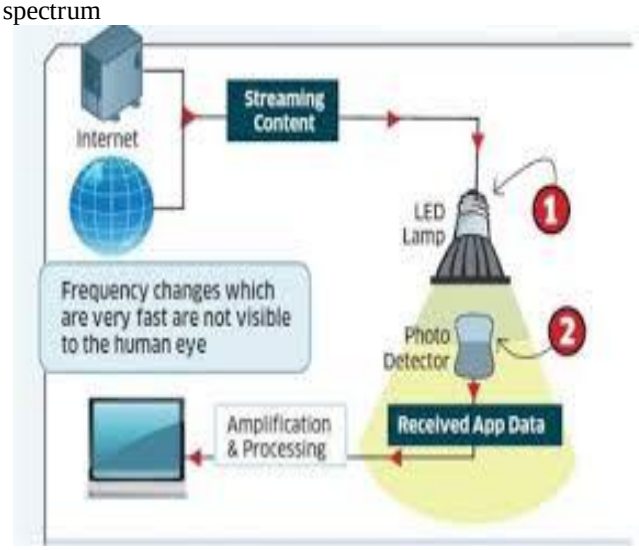
The LIFI product consists of 4 primary sub-assemblies:

- Bulb
- RF power amplifier circuit (PA)
- Printed circuit board (PCB)
- Enclosure

The PCB controls the electrical inputs and outputs of the lamp and houses the microcontroller used to manage different lamp functions. An RF (radio-frequency) signal is generated by the solid-state PA and is guided into an electric field about the bulb. The high concentration of energy in the electric field vaporizes the contents of the bulb to a plasma state at the bulb's center; this controlled plasma generates an intense source of light. All of these subassemblies are contained in an aluminum enclosure.

2 Function Of The Bulb Sub-Assembly

At the heart of LIFI is the bulb sub-assembly where a sealed bulb is embedded in a dielectric material. This design is more reliable than conventional light sources that insert degradable electrodes into the bulb. The dielectric material serves two purposes; first as a waveguide for the RF energy transmitted by the PA and second as an electric field concentrator that focuses energy in the bulb. The energy from the electric field rapidly heats the material in the bulb to a plasma state that emits light of high intensity and full spectrum



Bandwidth of Li Fi is more efficient and the consortium of Li Fi and the light emitting the data in the form of 0's and 1's with in the range. Representation of Spectral Power Distribution of LED light which transmits the data in the form of 00000111111111100101…. And it will be received by the Photo detector and amplification processing is done.

The Efficiency and the Life time of Light Source

Light Source	Efficacy (Lumen/Watt)	CRI	Lifetime ('000 hrs)
LIFI-STA-40-01	120	80	30
LIFI-STA-40-02	105	96	30
Metal Halide	85	65-75	12 - 20
LED	70	75	50
Ceramic Metal Halide	100	70-90	12 - 15
High Pressure Sodium	125	20	24
Low Pressure Sodium	180	<20	12 - 16

III. APPLICATIONS OF LI-FI

Now a days Wi-Fi is the most used technology by everyone, but there is an emerging technology **Li-Fi**, or **light fidelity**, that is it can be helpful in diagnosis of paients,Internet usage in Aero planes, In many software companies etc…

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