

# Transmission of Data through [Li-Fi] Light Fidelity From One PC to another PC.

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**Abstract** - Whether you're using wireless internet in the coffee shop, stealing it from the guy next door, or competing for bandwidth at a conference, you have probably got frustrated at the slow speeds you face when more than one device is tapped into the network. As many users and their dedicated devices access wireless internet, clogged airwaves are going to make that increasingly complex to latch in to a reliable signal. But radio waves are just one part of the spectrum that can carry the data. What if we could use some other type of wave to surf the internet? One German physicist, DR. Harald Haas, has come up with the solution they calls "Data Through Illumination" -taking the fiber out of fiber optics by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. It's the same idea behind infrared remote controls, but much more powerfull. Haas says his invention, which he calls D-Light, can produce data rates faster than 10 megabits/sec, which is faster than your average broadband connection. He looks out for a future where data for laptops, smartphones, and tablets is transmitted through the light in a room. And security would be a snitch-if you can't see the light, you can't access the data.

Keywords—Li-Fi, Wi-Fi, high-brightness LED, photodiode, wireless communication.

## 1. INTRODUCTION

From decades peoples are using radio waves to transmit their data from one device to another device, RF has many drawbacks in different areas of society. Li-Fi is a transmission of data and information through illumination of light by taking the fiber out of fiber optics by sending data through a LED light bulb that has variable intensity faster than the human eye can catch. Li-Fi is the term some

have used to label the speedier and low cost wireless-communication system, which is the optical version of Wi-Fi. The term was first used in this context by a scientist Harald Haas in his TED Global talk on Visible Light Communication. —At the main part of this technology is a new generation of high intensity LEDs, says Harald Haas from the University of Edinburgh, UK. Very simply, if the LED is on, you transmit a digital signal 1, if it's off you transmit a 0. Haas says,—They can be switched on and off very faster, which gives good opportunities for transmitted data. It is possible to encode data through the light by varying the rate of LED at which the LEDs flicker on and off to give different strings of 1s and 0s. The LED intensity is modulated so fast that human eye is unable to notice, so the output appears constant.

### 1.1 Relevance

The relevance of a project shows how efficient the output of the project which is to be specified by the evaluation or by using the project which were being submitted. That means the relevance of a project is always to be related to some goal and, for general research projects, such goal is mostly increase of our scientific knowledge, although it is sometimes also related to more direct social environmental benefits for our society. This project will help in many ways like data interception, high transmission of data. Whether you're using wireless internet in a coffee shop, stealing it from the guy next door, or competing for bandwidth at a conference, you've probably gotten frustrated at the slow speeds you face when more than one device is tapped into the network.

### 1.2 System Background

This technology uses visible light between 400 and 800 terahertz. It works like a Morse code of flickering light that is received as binary codes. the computer then converts it. All the technology needs to use is a specially designed LED light for data transmission. into readable data. The flickers are imperceptible to the naked eye.

foremost benefit is the low cost it can provide both light and data transmission, reducing wiring costs and other connection equipment.

Another benefit is of course, the faster data transmission. With that kind of speed, we can also turn the tide for data transmission which requires accuracy and real time speed, like medical applications (Hospitals) and health care technologies.

It is more secured since light cannot pass through walls, so intercepting data is impossible in closed rooms. It is also environment-friendly at the same time because it only requires minimal hardware, and light transmission is much safer than radio signals.

The intention is not to entirely replace Wi-Fi, because such action will not be feasible. The goal was to combine the existing Wi-Fi with Li-Fi technology to maximise potentials in the field of data transmission.

As per studies we are sending data from one computer system to the another computer system. User 1 send a message in text format from his system to the intended receiver that message goes through USB to TTL transistor and further it goes to the NPN driver.

The NPN driver then converts text format data into the binary form i.e. in the form of 0s and 1s.

## 2. LITERATURE SURVEY

The idea of Li-Fi was introduced by a German physicist, Harald Hass, which he also referred to as "data through an illumination". The term Li-Fi was first used by Haas in his TED Global talk on Visible Light Communication. According to Hass's, the light, which he referred to as D-Light, can be used to produce data rates higher than 10 megabits per second which is much faster than our average broadband connection. Li-Fi can play a major role in relieving the heavy load that the current wireless systems face since it adds a new and unutilized bandwidth of visible light to a currently available radio waves for the data transfer. Thus it offers much larger frequency band (300 THz) compared to that available in RF communications. Also, more data coming through the visible spectrum could help alleviate concerns that the electromagnetic waves that come with Li-Fi could adversely affect our health. Li-Fi is the term people have used to label the fast and cheap wireless communication system, which is the optical version of Wi-Fi. Li-Fi uses visible light instead of Giga hertz radio waves for data transfer. Transfer of data from one place to another is one of the most important day-to-day activities. The current wireless networks that connect us to the internet are much slower when multiple devices are connected. As the number of devices that access the internet increases, the fixed bandwidth available makes it much difficult to enjoy high data transfer rates and connect to secure network. But, radio waves are just a small part of a spectrum available for data transfer. A solution to this problem is by the use of the Li-Fi

## 3. PROBLEMS IN Wi-Fi

The following are the basic issues with radio waves:

a) **Capacity:** Wireless data is transmitted through radio waves which are limited and expensive. It has a limited bandwidth. With the rapidly growing world and development of technologies like 3G, 4G and so on we are running out of spectrum.

b) **Efficiency:** There are 1.4 million cellular radio base stations that consume massive amount of energy. Most of the energy is used for cooling down the base station instead of transmission. Therefore efficiency of such base stations is only 5%.

c) **Availability:** Availability of radio waves is a big concern. It is not advisable to use mobile phones in aero planes and at places like petrochemical plants and petrol pumps.

d) **Security:** Radio waves can penetrate through walls. They can be intercepted. If someone has knowledge and bad intentions, they may misuse it. This causes a major security concern for Wi-Fi.[11]

## 4. OBJECTIVES OF APPLICATION

- To effectively use light as a medium for wireless communication.
- To remotely control devices using light as communicating medium.
- To Develop a communication system in real time which is safe from radiation hazards unlike Wi-Fi (which uses radio communication).

## 5. SYSTEM ARCHITECTURE

### 5.1 SYSTEM DESCRIPTION

There are numerous technology available, from public internet access through street lamps to auto-piloted cars that communicate through their headlights.

Applications of Li-Fi can extend in areas where the Wi-Fi technology lacks its presence like medical technology, power plants and various other areas. Since Li-Fi uses just the light, it can be used safely in aircrafts and hospitals where Wi-Fi is banned because they are prone to interfere with the radio waves.

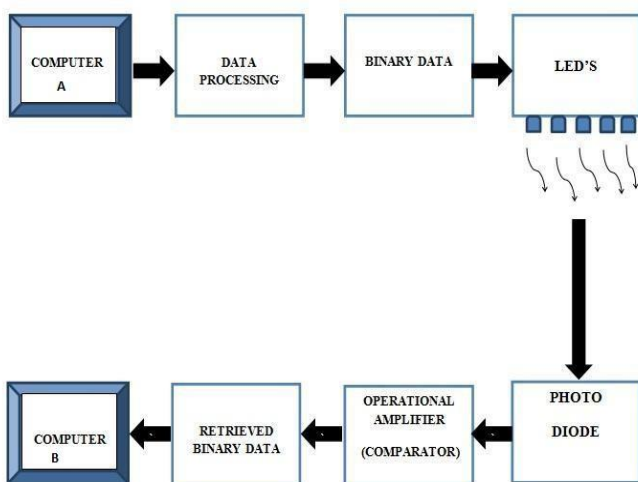
Li-Fi uses light rather than radio frequency signals so are intolerant to disturbances. VLC could be used safely in aircraft without affecting airlines signal. Integrated into medical devices and in hospitals as this technology doesn't deal with radio waves, so it can easily be used in all such places where Bluetooth, infrared, Wi-Fi and internet are broadly in use. Under water in sea Wi-Fi does not work at all

but light can be used and hence undersea explorations are good to go now with much ease. There are billions of bulbs worldwide which just need to be replaced with LED's to transmit data.

Security is a side benefit of using light for data transfer as it does not penetrate through walls.

On highways for traffic control applications like where cars can have LED based headlights, LED based backlights, and they can communicate with each other and prevent accidents.

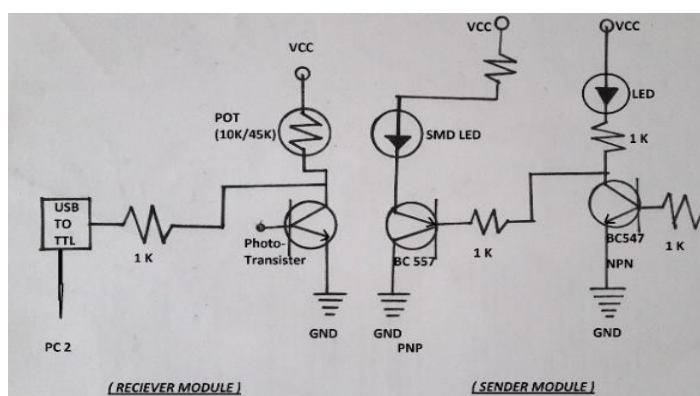
### 5.2 SYSTEM BLOCK DIAGRAM



**Fig-5.1 : Block Diagram**

Above Fig.5.1 show Block Diagram for transmission of data from one end pc to another end pc as same block diagram in reversible order for another end at the time of Bi-directional data transmission from .

### 5.3 SYSTEM CIRCUIT DIAGRAM

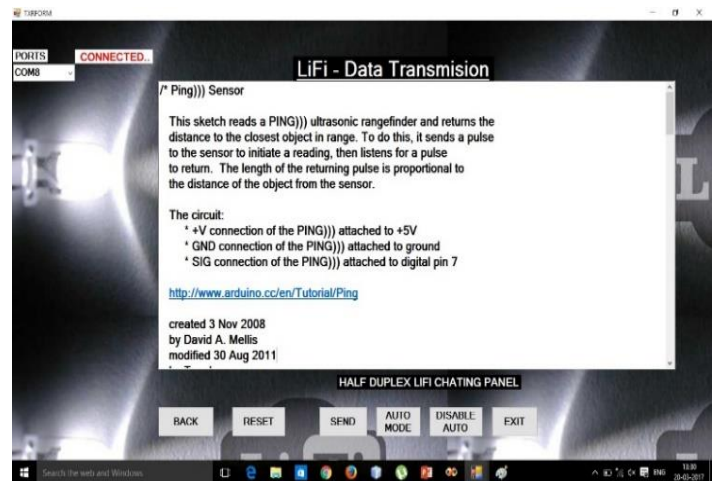


**Fig-5.2 : Circuit Diagram**

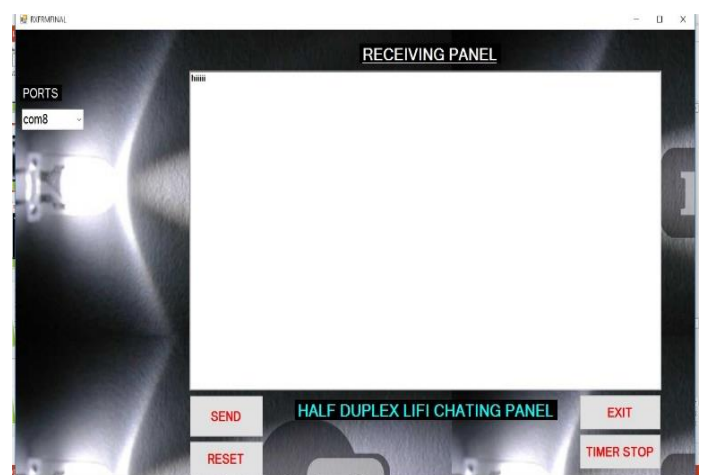
Above Fig.5.2 show Circuit Diagram for transmission of data from one end pc to another end pc as same block

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### 5.4 RESULT



**Fig-5.3 : Data Transmission From PC1**



**Fig-5.4 : Data Receiving From PC1**

### 6. COMPARISON OF WIRELESS NETWORKS

CHARACTERISTICS	BLUETOOTH	WI-FI	LI-FI
Frequency	2.4GHz	2.4 GHz-5GHz	No frequency for light
Range	10 meters	100 meters	Based on LED light falling
Primary application	WPAN	WLAN	Where ever light is available
Data Transfer rate	800Kbps	11Mbps	>1 Gbps
Power Consumption	Low	Medium	Medium
Cost	Low	Medium	Low
Security	Less secure	Medium secure	High secure
Primary Devices	Mobile phones, PDAs, consumer electronics, office and industrial automation devices	Notebook computers, desktop computers, servers, latest mobiles, iPods, etc.	Mobile phones, PDAs, consumer electronics, office and industrial automation devices Notebook computers, desktop computers, servers, latest mobiles, iPods, etc. and other latest devices with Li-fi
Primary Users	Traveling employees, electronics consumers office and industrial workers	Corporate campus users and homes, flats, public places	Traveling employees, Corporate campus users and homes, flats, public places and industrial areas, power plants, hospitals.
Usage Location	Anywhere at least two Bluetooth devices exist	Within range of WLAN infrastructure, usually inside a building	Anywhere where light is available like roads, public place, home, office, etc.
Standard	IEEE 802.15	IEEE 802.11b	IEEE 802.15
Operating Band	ISM Band at 2.5 MHz	RF Band	Visible Light band
Maximum Members	7 members can connect at a time	Number of devices connected depends on bandwidth availability	Number of receivers present under light
Development Started	1998	1990	2011
Working Concept	Master-slave	Various Topologies	Direct binary data serving

Fig-6.1 : Comparison of Wireless Networks[10]

### 7. APPLICATIONS OF LI-FI

1. While Wi-Fi is in place in many hospitals, interference from cell phones and computers can block signals from monitoring equipment. Li-Fi solves both problems: lights are not only allowed in operating rooms, but tend to be the most glaring fixtures in the room.

2. Airlines: In aircraft LiFi can be used for data transmission.

3. It can be used in petroleum or chemical plants where other transmission or frequencies could be hazardous.

4. Smarter Power Plants: Wi-Fi and many other radiation types are bad for sensitive areas. Like those surrounding power plants. But power plants need fast, inter-connected data systems to monitor things like demand, grid integrity and (in nuclear plants) core temperature. The savings from proper monitoring at a single power plant can add up to hundreds of thousands of dollars. Li-Fi could offer safe,

abundant connectivity for all areas of these sensitive locations. Not only would this save money related to currently implemented solutions, but the draw on a power plant's own reserves could be lessened if they haven't yet converted to LED lighting.

5. Undersea Awesomeness: Underwater ROVs, operate from large cables that supply their power and allow them to receive signals from their pilots above. ROVs work great, except when the tether isn't long enough to explore an area, or when it gets stuck on something.

If their wires were cut and replaced with light — say from a submerged, high-powered lamp — then they would be much freer to explore. They could also use their headlamps to communicate with each other, processing data autonomously and referring findings periodically back to the surface, all the while obtaining their next batch of orders. It could keep one informed regarding an earthquake or a hurricane. Remember, with Li-Fi, if there's light, you are online. Subway stations and tunnels, common dead zones for most emergency communications, pose no obstruction. Plus, in times less stressing cities

could opt to provide cheap high-speed Web access to every street corner.

6. Hospitals: Can be used in the places where it is difficult to lay the optical fiber like hospitals. In the operation theatre LiFi can be used for modern medical instruments.

7. Traffic Signals : LiFi can be used which will communicate with the LED lights of the cars and accident numbers can be decreased. Thousand and millions of street lamps can be transferred to LiFi lamps to transfer data. [12]

## 8. FUTURE SCOPE

- Turning light bulbs into super-speed broadband wireless Internet systems.
- Smartphones will soon be able to download traffic information from traffic lights.
- In the future, shops will transmit advertisements to our phone as we pass by and bus schedule changes will be transmitted to a screen at the stop.
- Smarter home appliances that talk machine-to-machine (M2M) are already being extensively researched, where LED lights on electronics function as Li-Fi access points [12].

Li-Fi technology will in future enable faster, more reliable internet connections, even when the demand for data usage has outgrown the available supply from existing technologies such as 4G, LTE and Wi-Fi. It will not replace these technologies, but will work seamlessly alongside them[12].

In future, Li-Fi scheme provides the greener environment and safer as well as faster transmission using Internet of Things.

## 8. CONCLUSIONS

We learnt how proposed system is better than the existing system. It is compatible to everyone, we will generate the unique-id. Through proposed system the standard will maintain to particular area. Hence using this system everyone will get benefited. We are trying to develop a alternative approach to the existing system.

The transmission of data through light fidelity is much more secure and faster than the existing system.

## REFERENCES

[1] Harald Haas. "Harald Haas: Wireless data from every light bulb". ted.com.

[2] Sherman, Joshua (30 October 2013). "How LED Light Bulbs could replace Wi-Fi". Digital Trends. Retrieved 29 November 2015.

[3] "'Li-fi' via LED light bulb data speed breakthrough". BBC News. 28 October 2013. Retrieved 29 November 2015

[4] Haas, Harald (July 2011). "Wireless data from every light bulb". TED Global. Edinburgh, Scotland.

[5] "Li-Fi: A green avatar of Wi-Fi". Livemint. 9 January 2016. Retrieved 24 February 2016.

[6] Vincent, James (29 October 2013). "Li-Fi revolution: internet connections using light bulbs are 250 times". The Independent. Retrieved 29 November 2015.

[7] Povey,, Gordon. "About Visible Light Communications". pureVLC. Archived from the superfast modern intelnet technology.

[8] An Internet of Light: Going Online with LEDs and the First Li-Fi Smartphone, Motherboard Beta, Brian Merchant original on 18 August 2013. Retrieved 22 October 2013.

[9] An IEEE Standard for Visible Light Communications visiblelightcomm.com, dated April 2011.

[10]<http://www.yuvaengineers.com/li-fi-technology-in-wireless-communication-revathi-ganesan/>

[11] *IJCTA* Rahul R Sharma et al , Int].Computer Technology & Applications,Vol 5 (1),150-154 ISSN:2229-6093 *Li-Fi Technology Transmission of data through light*

[12] *IJIREEICE* ISSN 2321 – 5526 Certified Vol. 4, Issue 11, November 2016 Copyright to *IJIREEICE* DOI 10.17148/*IJIREEICE*.2016.41122 116

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