

# LI-FI BASED AUDIO COMMUNICATION AND DEVICE SWITCHING

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**ABSTRACT**-From many years, there is a rapid development in the solid state LED materials which gave way for the future generation data communication known as visible light communication(VLC). VLC has a promising future and it acts as a complement to the RF communication by achieving larger bandwidth and high data rate. At present, the day to day activities use lot of LED based lights. which can also be used for communication because of the advantages like fast switching, high efficiency and safe to human vision. Hence, this paper presents about audio communication and device switching through visible light which consists of the LEDs that transmit data to the receiver. The receiver circuit consists of solar panel or power led based on its application connected with the amplifier and output circuit to recover back the amplified version of original input signal.

Keywords: Light Feudality, Wireless Feudality, RF Communications.

## I. INTRODUCTION

One of the most evolving technologies in industry

today is the wireless technology. In wifi technology it has many drawbacks like RF waves can harm living beings which may cause many skin diseases where new wireless technology came in to existence called LI\_FI which will overcome the drawbacks of WI-FI because it uses visible

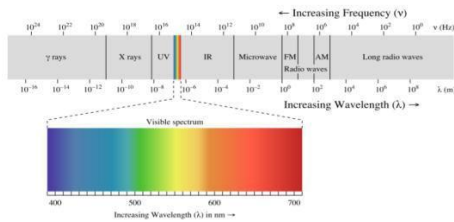


Fig.1.1 The Electromagnetic Spectrum

Fig. 1.1 shows the electromagnetic spectrum of different frequency and wavelength for communication medium.

Fig. 1.2 shows the wavelength associated for visible light medium. Visible light communication (VLC) data communication medium using visible light operates between 400 THz (780 nm) and 800 THz (375 nm). Li-Fi transmits data using the spectrum of vlc at a speed of 10 to 20Gbit/s more than 200 times faster than ‘superfast’ data device [12].

light for communication which is harmless. As we know, speed of light is  $3 \times 10^8$  m/s so that the problem of speed in WI-FI can be relieved .it also has many applications like device switching audio communication and data transfer.

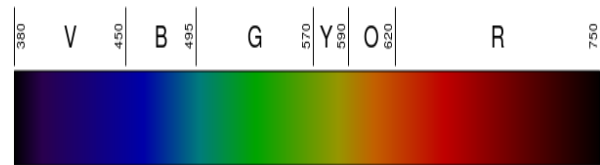
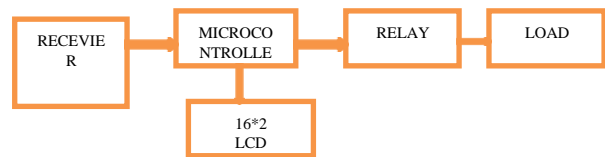


Fig.1.2 The visible spectrum

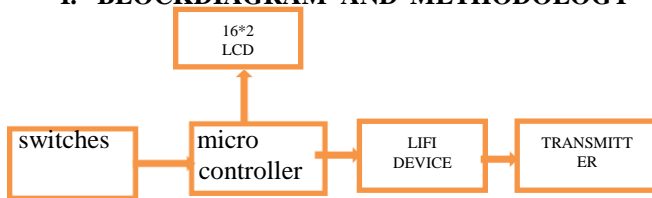
## 1.1 OBJECTIVE

To design and implement a communication system in the real time environment using Li-Fi, such that



it can communicate with maximum speed and with better efficiency. And also to build a Switching system for commercial use in home\office appliances which can be switched ON and OFF very quickly, for real time application.

## I. BLOCKDIAGRAM AND METHODOLOGY



From all the block diagrams the blocks are explained as follows

### SWITCHES

- the lifi module which consists of switches (push buttons) is connected to microcontroller with different ports
- this same controller is connected to the 16\*2 lcd display, which notify the on of state of switches and displays on lcd.

### LIFI DEVICE

- the lifi circuit consisting of coil,led light and a battery
- the input is fed through the controller and this high frequency low voltage is amplified through the amplifier.
- Due to the current modulation the intensity of light varies propositionally .through this illumination data is transferred, with output high.

### PHOTO TRANSISTOR

- It acts as receiver for device switching module.
- Initially the output of photo transistor will be zero,even if the supply is given because base voltage is zero.
- When the base voltage is applied from the transmitter through led ,the output of photo transistor will be high ,hence current flows through the diverted path.

### RELAY

- It senses the output of microcontroller and it tripsto give output to the load depends on its rating[type =PCB relay].

### LOAD

- Any type of load can be used either AC or DC load.

### SOLAR PANEL

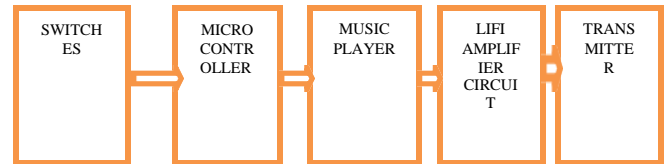


Fig 2.1 Block diagram of transmitter

- It is a type of photo cell ,which receives light illumination falling on it and this is converted in to electrical signal.

### SPEAKER

- It is the output device which converts electrical signal to original sound signal.

### 2.2 ADVANTAGES:

- It is free from bandwidth.
- very low maintenance cost.
- Very Cheaper than Wireless-Fidelity.
- Theoretical speed up to 1 GB per second, higher speed than wifi .
- Lower electricity costs.
- Vlc is for free and it will not harm human vision

## II. IMPLEMENTATION

Implementation results and micro controller kit figures 2.5, 2.6, 2.7 are shown below:



Fig 2.5 Device switching



Fig 2.6 Microcontroller with LCD



Fig 2.7 Audio receiver with solar panel

### III. APPLICATIONS

#### 1. SMART LIGHTING

Smart buildings like MNC's, hospitals, theaters etc require smart lighting. for smart communication where lifi provides illumination as well as secured communication.

#### 2. HAZARDOUS ENVIRONMENTS

Wifi can't be used in hazardous environments like petro chemical plants, mining plants due to chemical reactions maytakesplace, lifi provides visible light which will not harm.

#### 3. OTHER APPLICATIONS

- Mobile connectivity, vehicle and transportation, defense and security, hospitals and health care etc

- [7]Haas, Harald (July 2011)."Wireless data from every light bulb".*TED Global*. Edinburgh, Scotland.
- [8]T. Ishii , M. Hirose and H. Iwata "Automatic Recognition of Driver's Facial Expression by Image Analysis", Journal of JSAE, vol. 41, no. 12, pp.1398 -1403
- [9]M. Kaneda "Development of a Drowsiness Warning System", The 14th International
- [10] [www.lificonsortium.org](http://www.lificonsortium.org)
- [11] <http://beyondweblogs.com/what-is-Li-Fi-is-this-replacing- Wi-Fi/>
- [12] <http://en.wikipedia.org/wiki/Li-Fi>
- [13] Electronic Communication Systems – George Kennedy
- [14] Electronics in Industry - George M.Chute
- [15]Principles of Electronics - V.K.M

### IV. CONCLUSION

1) *The Wi-Fi technology which uses radio frequency to broadcast the data and currently offers very high data rate but insufficient for moving large data files like HDTV movies, music libraries and video games.The use of radiofrequency communication devices is increasing widespread, some emissions and intensities interfere with sensitive electronic equipment brings severe damages. To remedy this limitation of current technology, we can utilize visible light communication [VLC], known as Li-Fi technology. Li-Fi appears to be an important potential component in expanding usable bandwidth, protecting sensitive electrical equipment and data, creating more biologically friendly communications technology, and helping to develop seamless computing applications.*

### REFERENCES

- [1]DHAKANEVIKASNIVRUTTI, RAVI RAMCHANDRANIMBALKAR, —LIGHT-FIDELITY: A RECONNAISSANC OF FUTURE TECHNOLOGY| VOLUME 3, ISSUE 11, NOVEMBER 2013
- [2]Tsonev, D.;Sinanovic, S.; Haas, Harald (15 September 2013). An IEEE Standard for Visible Light Communicationsvisiblelightcomm.com, dated April 2011.. "Complete Modeling of Nonlinear Distortion in OFDM-Based Optical Wireless Communication". *IEEE Journal of Lightwave Technology* 31 (18): 3064–3076.doi:10.1109/JLT.2013.2278675
- [3]Tony Smith (24 May 2012). "WTF is... Li-Fi? Optical data transfer's new leading light?".*The Register*. Retrieved 22 October 2013.
- [4]Iain Thomson (18 October 2013). "Forget Wi-Fi, boffins' get 150Mbps Li-Fi connection from a light bulb: Many (Chinese) hands make light work".*The Register*. Retrieved 22 October 2013. [5]"Visible-light communication: Tripping the light fantastic: A fast and cheap optical version of Wi-Fi iscoming".*The Economist*. 28 January 2012. Retrieved 22 October 2013.
- [6]Technopits.blogspot.comtechnology.cgap.org /2012/01/11/a-Li-Fi-world/