

## “Li-Fi, technology a bright tomorrow in the perspective of developing country “

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**ABSTRACT:** with the advent of the information communication technology, world have become a town, the demand of the technology is uprising vertically and horizontally in terms of development of the nation and its economy. Today if we look on the retails market or any other traditional and professional business or service, we find the integrated role of the communication technology, and its proportionate relationship with the business development. Service sector with the use of ICT are more profitable and tangible benefits in terms of the returns and the sustainability. To prototype the frame work of national communication channel to meet the demand of the service of ICT by the society and the requirement of Energy to meet and sustain the frame work of communication Technology, LI-Fi may play an important and vital role. The national mission of digital India may bring the fruits with the development of the LI-Fi Communication Technology. Present paper enlight the issues and solution to prove the LI-Fi as one of the pioneer technology which is clean and green.

**KEYWORDS:** Microwave, Li-Fi, BTS, OFC, Electro Magnetic Interference, Spectram

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### I. INTRODUCTION

Nowadays communication is an essential part of our life, it has been spread in each and every part of world. It is not only needed for entertainment but also in all important field like education, business, air traffic control e.t.c.. It's not possible to run this world without communication even for one day. We have started communication with cables, then OFC and ultimately switched to wireless communication with microwaves. Microwaves have several advantages on other type of communication mode but due to increasing demand of data the spectral becomes so dense that if it will continue for some more year there is a chance of such Electro Magnetic Interference that all communication system will crashed. Furthermore electro magnetic waves has hazardous effect on human body.

By taking all these issues in account we are trying to use this new mode of communication called Li-Fi. Li-Fi is a wireless communication same as present with only difference of wavelength, here we are using visible light spectrum in place of microwave which will overcome all issues mentioned above. Issues with Microwave – (1) Issues in terms of Communication - Wireless communication using microwave was a best option till now. But as we can see in fig.1 it has a limited bandwidth which can not fulfill the increasing demand of data. Furthermore it is more expensive and less secure if we compare with visible light spectrum.

The most important issue in electronics is power consumption. Many research is going on in many field to reduce power consumption as at this point we need to save energy wherever and however possible. Microwave communication has high power consumption which is the major drawback of the same. This issue encourage us to search for a better alternative and it ends to LI-FI. Apart from these major issues microwave communication has comparatively less speed, limited range and less security

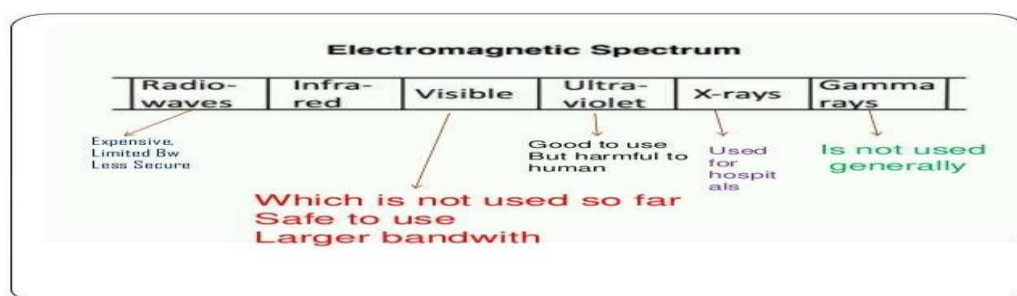
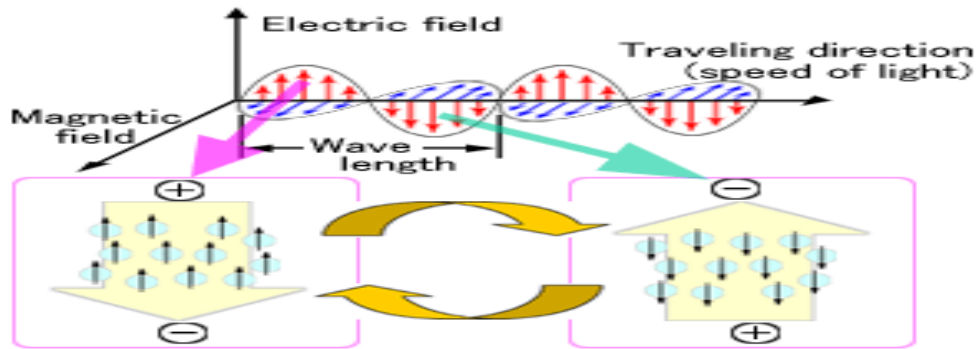


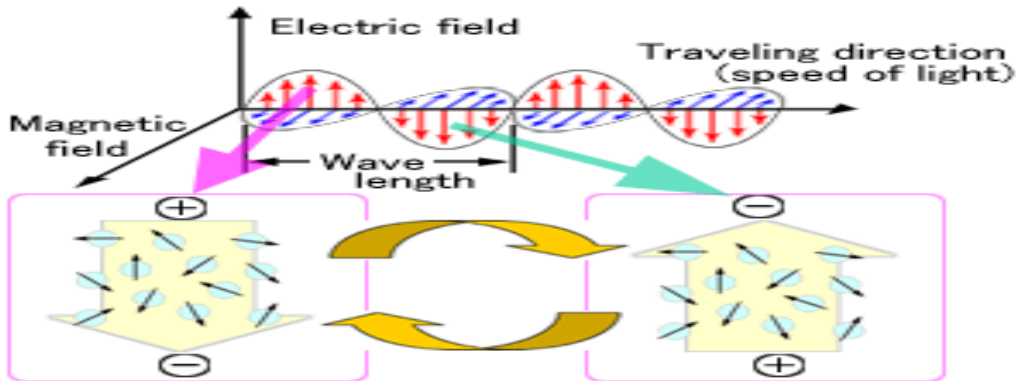
Fig -1

(B) Health Issues with Microwave-After a research it is found that microwave has negative effect on human body. Figure two **Figure 2** shows a case where a too much lower frequency of radio wave is irradiated to the permanent dipole of water. In this case, the permanent dipole will immediately follow the directions of electric field. So in this case, water doesn't generate heat.



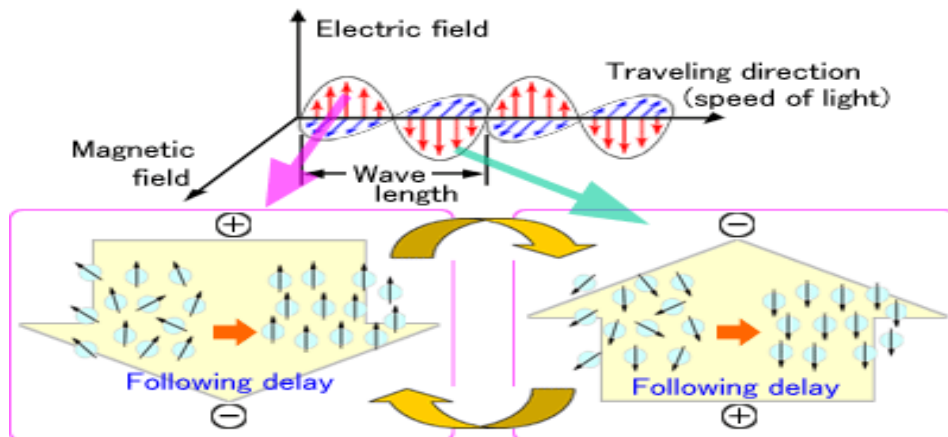
**Figure 2 At too lower frequency of radio wave**

On the other hand, Figure 3 shows a case where a too much higher frequency of EM wave is irradiated to the permanent dipole. In this case, since electric field changes its direction too fast, dipole won't be able to follow. Then, water does not generate heat in this case also.



**Figure 3 : At too high frequency ( light and IR wave**

In contrast to these, Figure 4 shows a case where moderate frequency of radio wave is irradiated to the permanent dipole. In this case, the permanent dipole changes a little behind the electric field. During the time delay, water is absorbing energy from radio wave and generate heat. and, this moderate frequency is the microwave.



**Figure 4: At moderate frequencies of radio wave( microwave range)**

When a human body is exposed to the electromagnetic radiation, it absorbs radiation, because human body consists of 70% liquid. Microwave absorption effect is much more significant by the body parts which

contain more fluid (water, blood, etc.), like the brain which consists of about 90% water. Effect is more pronounced where the movement of the fluid is less, for example, eyes, brain, joints, heart, abdomen, etc.

- Irreversible infertility
- Risk to Children and Pregnant Women
- Increase in Cancer risk
- Sleep Disorders
- Salivary gland tumor

Adverse effect on birds, animals and environment and many more Li-Fi a Cleaner and Greener Solution – As we have seen many issues in microwave a Li-Fi is a better solution . In Li-Fi we are using light waves so we need light source to emit light which consume enormous less power as compare to transmitter used in microwave communication. Following are some light sources and their features we use in Li-Fi.

- 1.Incandescent bulb
  - First industrial light source
  - 5% light, 95% heat
  - Few thousand hours of life
- 2.Fluorescent lamp
  - White light
  - 25% light
  - 10,000s hours
- 3.Solid-state light emitting diode (LED)
  - Compact
  - 50% light
  - More than 50,000 hours life span

A 1800 band BTS power need is nearly 3 KW out of which only 4% energy is transmitted as data. Rest is wasted in radio equipments and cooling system. The tariff rates become cheaper as light waves are cheaply available. Excess capacity demands of cellular networks can be off-loaded to Li-Fi networks where available. This is especially effective on the downlink where bottlenecks tend to occur.

Moreover Li-Fi is faster and more secure as light can not penetrate through walls. Also there is no interference problem we can use this system in hospitals , aeroplan , underwater communication and mines and petrochemical plants .

## II. CONCLUSION

LI-Fi will be able to transfer the power as a efficient energy saving alternative of Wi-Fi with more secure, reliable ,compact transmitter and receiver ,faster data transfer and wider bandwidth. This may also solve issues such as the shortage of radio-frequency bandwidth and allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals. Table.1 shows comparison of microwave and Li-Fi technology .

Property		VLC	RF
	Bandwidth	Unlimited, 400nm~700nm	Regulatory, BW Limited
	EMI	No	High
	Line of Sight	Yes	No
	Standard	Beginning (IG-VLC)	Matured
Mobile To Mobile	Hazard	No	Yes
	Visibility (Security)	Yes	No
	Power Consumption	Relatively low	Medium
Infra to Mobile	Distance	Short	Medium
	Visibility (Security)	Yes	No
	Infra	LED Illumination	Access Point
	Mobility	Limited	Yes
	Coverage	Narrow	Wide

**Table .1** LiFi VS Microwave

#### Future research work

Li-Fi technology and its application can be further extended an entire wireless architecture and investigate time factors, type of traffic affected, various reliability and maintainability growth, constancy and deterioration. Simulation modeling can be further extended for different network topologies such as WIB star and WIB rings to evaluate the performance for different network topologies. Cost functions can be developed and simulation can be designed for an optimal set of dependability and cost of WIB. This analysis can be further applied for 3G and 5G wireless technology. Effectiveness of neural network modeling can be evaluated for an entire PCS architecture and different network topologies and variable sized WIBs. Reverse engineering can be carried out for neural networks to find the optimal set of inputs (component MTTF and MTR values). NN modeling can also be implemented with empirical data, provided by wireless carriers for more accurate perspectives of ARMS.

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