



Bansilal Ramnath Agarwal Charitable Trust's  
Vishwakarma Institute of Technology  
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## DEPARTMENT OF INFORMATION TECHNOLOGY

IT- BULLETIN

November - 2023

# LiFi (Light Fidelity) & its Applications

Welcome to the edition of the IT-BULLETIN on LiFi (Light Fidelity) & its applications Newsletter!

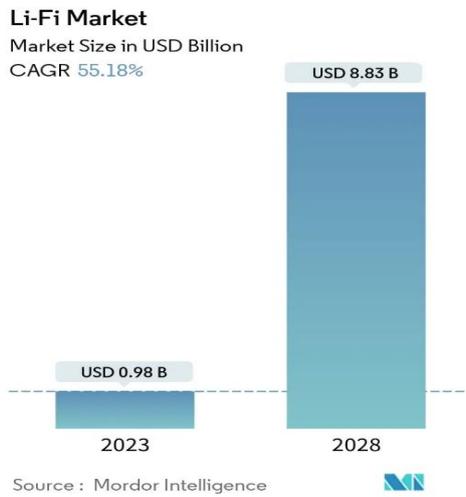
In this monthly publication, we bring you the latest news, trends, and developments in the exciting Words of LiFi.



## **Introduction**

- In the era of overcrowded (data communication) world, LiFi is a new way of wireless communication that uses LED lights to transmits data wirelessly. Transmission of data is one of the most important day to day activities in the fast growing world.
- The current wireless networks that connect us to the Internet are very slow when multiple devices are connected.
- Also, with the increase in the number of devices which access the Internet, the availability of fixed bandwidth makes it much more difficult to enjoy high data transfer rates and connect a secure network.
- Radio waves are just small part of the electromagnetic spectrum available for data transfer. LiFi has got much Broader spectrum for transmission.
  
- The idea of Li-Fi was introduced for the first time by a German physicist Harald Hass in the TED (Technology, Entertainment, Design) Global talk on Visible Light Communication (VLC) in July 2011, by referring to it as “data through illumination”. He used a table lamp with an LED bulb to transmit a video of a blooming flower that was then projected onto a screen. In simple terms, Li-Fi can be thought of as a light-based Wi-Fi i.e. instead of radio waves it uses light to transmit data. In place of Wi-Fi modems, Li-Fi would use transceivers fitted with LED lamps that could light a room as well as transmit and receive information. By adding new and unutilized bandwidth of visible light to the currently available radio waves for data transfer, LiFi can play a major role in relieving the heavy loads which the current wireless system is facing. Thus it may offer additional frequency band of the order of 400 THz compared to that available in RF communication which is about 300 GHz. Also, as the Li-Fi uses the visible spectrum, it will help alleviate concerns that the electromagnetic waves coming with Wi-Fi could adversely affect our health.

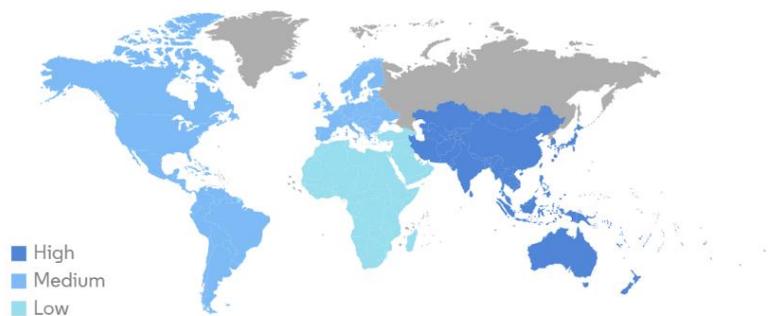
## Market Size



## **Li-Fi (Light Fidelity) Market – Growth rate by region**

Study Period	2018 - 2028
Market Size (2023)	USD 0.98 Billion
Market Size (2028)	USD 8.83 Billion
CAGR (2023 - 2028)	55.18 %
Fastest Growing Market	Asia Pacific
Largest Market	North America

Li-Fi (Light Fidelity) Market - Growth rate by region



Source: Mordor Intelligence



The Light Fidelity (Li-Fi) market is poised for significant growth, with projections indicating a substantial increase from USD 0.98 billion in 2023 to USD 8.83 billion by 2028, at a remarkable CAGR of 55.18% during the forecast period. Li-Fi technology utilizes light, particularly LED bulbs, to facilitate fast and efficient data transmission, outpacing conventional Wi-Fi. This growth can be attributed to the escalating demand for high-speed networks and energy-efficient solutions, as well as the expanding scope of Li-Fi for commercial applications. With the surge in smart and connected devices, existing networking technologies like Wi-Fi and 5G are being stretched to their limits, leading to a need for high-speed, high-capacity, and secure connectivity, which Li-Fi can deliver. Furthermore, Li-Fi has the potential to revolutionize various industries by enabling the Internet of Things (IoT) and applications in Industry 4.0 and the emerging light-as-a-service (LaaS) in the lighting sector. However, challenges such as awareness, limited range, and the need for gadget manufacturers to integrate Li-Fi receivers in their products may constrain its adoption. The COVID-19 pandemic, though disruptive across industries, has underscored the importance of technology in healthcare, where Li-Fi may have a significant role to play in addressing the demands of medical facilities and hospitals during challenging times.

## Architecture of Li-Fi System

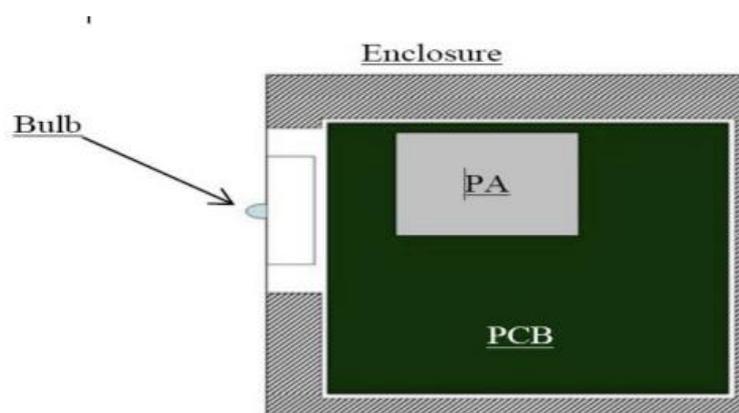
Li-Fi which can be the future of data communication appears to be a fast and cheap optical version of Wi-Fi. Being a Visible Light Communication (VLC), Li-Fi uses visible light of electromagnetic spectrum between 400 THz and 800 THz as optical carrier for data transmission and illumination. It uses fast pulses of light to transmit information in wireless medium. The main components of a basic Li-Fi system may contain the following:

- a) A high brightness white LED which acts as transmission source.
- b) A silicon photodiode with good response to visible light as the receiving element

Switching the LEDs on and off can make them generate digital strings with different combination of 1s and 0s. To generate a new data stream, data can be encoded in the light by varying the flickering rate of the LED.

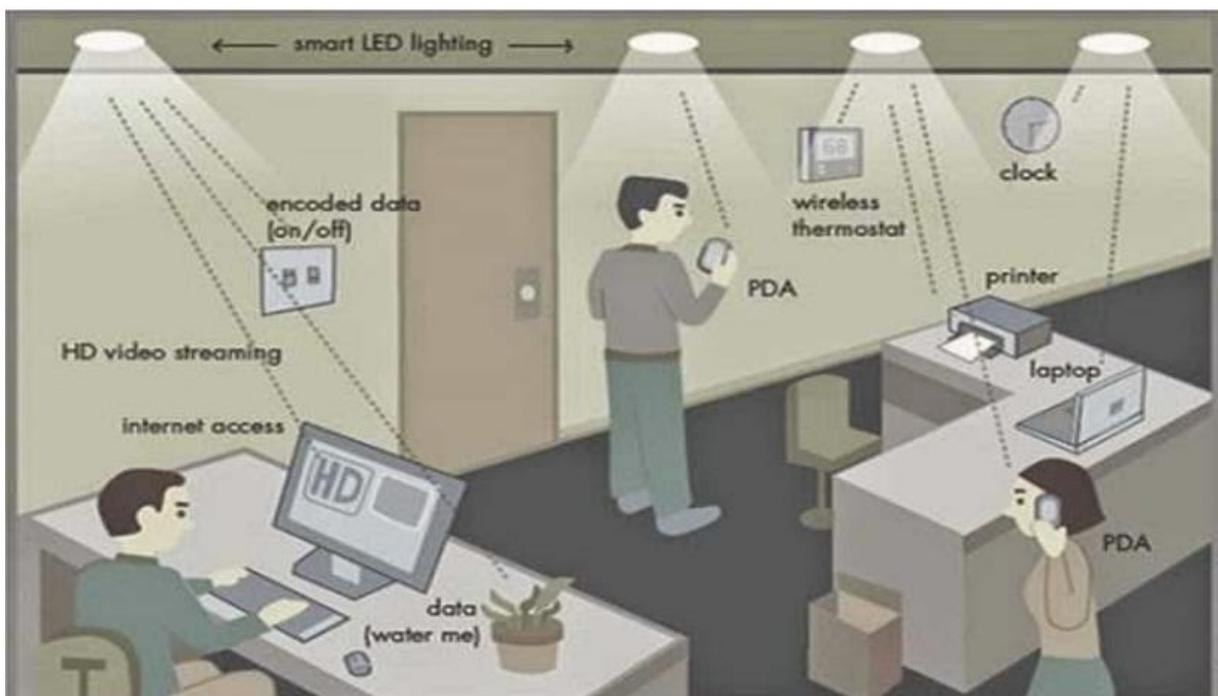
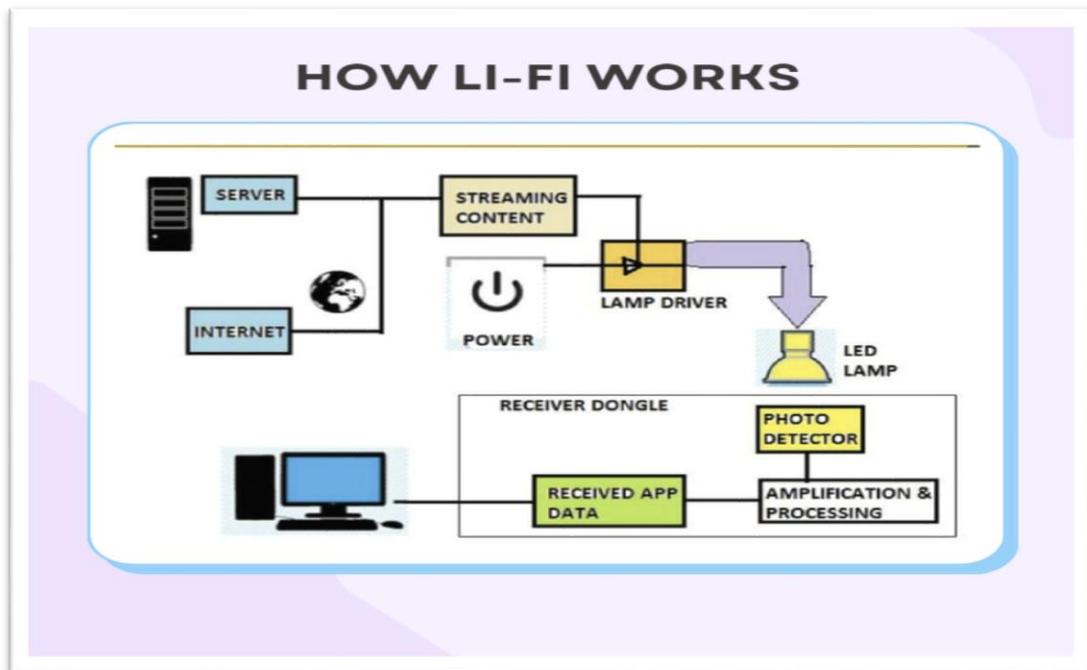
The Li-Fi transmitter system comprises of four primary subassemblies:

- Bulb
- RF Power Amplifier Circuit (PA)
- Printed Circuit Board (PCB)
- Enclosure



*Fig 2: Block Diagram of Li-Fi sub-assemblies.*

The Printed circuit board (PCB) controls the electrical inputs and outputs of the lamp and houses the microcontroller used to manage different lamp functions. A Radio Frequency (RF) signal is generated by the Power Amplifier and is directed into the electric field of the bulb. As a result of the high concentration of energy in the electric field, the contents of the bulb will get vaporized into a plasma state at the bulb's centre. And this controlled plasma in turn will produce an intense source of light.



## Impact of implementing Li-Fi in Business

**IMPACT OF IMPLEMENTING LI-FI IN BUSINESS**

**01 Indoor Positioning and Location-Based Services:**  
Li-Fi can be used for precise indoor positioning and location-based services. This can benefit businesses in retail, hospitality, and logistics, allowing them to provide tailored services and optimize operations.

**02 IoT Integration:**  
The Internet of Things (IoT) is a growing trend in business, and Li-Fi can seamlessly integrate with IoT devices, enabling real-time data communication in IoT networks. This is valuable in industries like manufacturing, agriculture, and smart buildings.

**03 Augmented Reality (AR) and Virtual Reality (VR):**  
Li-Fi's low-latency and high-speed data transmission capabilities are essential for AR and VR applications. Businesses in entertainment, education, and training can use Li-Fi to provide immersive experiences with minimal lag.

## References

- <http://www.warse.org/pdfs/2014/icetetssp25.pdf>
- <http://www.onlinejournal.in/IJRV2I6/006.pdf>
- <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6685753>
- <https://www.ijsr.net/archive/v5i9/26051603.pdf>
- <https://www.ijsr.net/archive/v4i12/NOV151778.pdf>
- [http://www.ijarcsse.com/docs/papers/Volume\\_5/6\\_June2015/V5I6-0175.pdf](http://www.ijarcsse.com/docs/papers/Volume_5/6_June2015/V5I6-0175.pdf)
- <http://www.ijcta.com/documents/volumes/vol5issue1/ijcta2014050121.pdf>
- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.666.5679&rep=rep1&type=pdf>
- [http://www.ijarcsse.com/docs/papers/Volume\\_3/11\\_November2013/V3I11-0434.pdf](http://www.ijarcsse.com/docs/papers/Volume_3/11_November2013/V3I11-0434.pdf)

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