LI – FI : LIGHT FIDELITY – A CRITICAL TECHNICAL STUDY

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Abstract
Li – Fi is a fully networked wireless technology which makes use of light waves instead of radio waves to deliver data. Li – Fi uses visible light communication or infra-red and near ultraviolet spectrum, part of Optical wireless communications technology, which carries much more information, and has been proposed as a solution to the RF-bandwidth limitations. This paper focuses on the Li – Fi technology, its advantages and challenges over Wi – Fi.

Keywords: Li – Fi (Light Fidelity), Wi – Fi (Wireless Fidelity), LED (Light Emitting Diode), VLC (Visible Light Communication).

1. Introduction
Nowadays Internet plays a vital role in our life. The use of Smartphone, tablet and many other devices has made the mobile information access a central feature [1]. Wi-Fi is widely used in all the public areas like home, cafes, hotels, airports. Due to this radio frequency is getting blocked day by day, at the same time usage of wireless data is increasing exponentially every year. In order to overcome this problem in future, light – fidelity (Li-Fi) technology came into existence since 2011. Li-Fi is a wireless communication system in which light is used as a carrier signal instead of traditional radio frequency as in Wi-Fi. Li-Fi is a technology that uses light emitting diodes (LED) to transmit data wirelessly [2].

Li – Fi technology can transmit data and unlock capacity which is 10,000 times greater than that available within radio spectrum [2].

2. Literature Review
Wi – Fi (Wireless Fidelity) uses 2.4 GHZ (12 cm) UHF and 5 GHZ (6 cm) SHF radio bands to deliver internet access. Besides this, Wi – Fi has certain limitations such as precision indoor positioning and gesture recognition and insufficient for transferring large data file [3].

On the other hand, optical wireless technologies also known as VLC and recently referred as Li – Fi offers high speed, flexibility and usability [4].

Fig – 1 : Li – Fi as a superset of different optical wireless communication. [4]
3. Technical Details of Li – Fi
Below shown is the representation how the Li – Fi will work and also shows that many devices can be connected simultaneously and data transfer can be done with ease.

The LED Lamp streams the data at ultra high speed to photo – detector. The receiver dongle converts the tiny charges into electrical signals, which is then converted back into data stream and then transmitted to connected device.

4. Research Background


2. Ultra – Parallel Visible Light Communication (UP – VLC) : Combines optical Communication with lighting functions, where high density LEDs provide independent communication channels [2].

3. Tackling the Looming Crisis in wireless Communication : Proposes Spectrum Crisis, where demand for data send through wireless network increases far faster than necessary bandwidth[2].

4. Towards Ultimate Communication Network Convergence (TOUCAN) : Develops a unified information – driven ICT architecture where network and devices will optimally interconnect any user [2].

5. Advantages of Li – Fi over Wi – Fi

1. High speed i.e. 500Mbps.
2. Uses light rather than radio frequency.
3. Enhanced wireless infrastructures.
4. The avoidance of radio frequency spectrum crunch (10,000 times more capacity).
5. Enabling internet of Things (IoT).
7. Enhanced energy efficiency.
6. Disadvantage of Li – Fi

There are some drawbacks like it cannot work without line – of – sight. When the line – of – sight is well at that time only it can transmit the data.

7. Applications of Li – Fi

1. Li – Fi uses light and it does not pass through walls, so with minimal precautions leakage is avoided.

2. Provides interference – free wireless communication.

3. Use of Li – Fi enabled lamps would provide network of internet access point.

4. Li – Fi enabled lighting in aircrafts allows high data rate connectivity for passengers which results into less cables and lighter aircraft.

5. In Museums and Galleries, Li – Fi enabled lighting provides localized information within that light.

6. Using display lighting as Broadcast channel, advertising information, special offers and coupons can be viewed.

7. Li – Fi uses lights which can penetrate for large distance under water enabling communication from diver to diver.

8. LED headlights and tail lights in Car exchanges information on driving conditions between vehicles.

9. Li – Fi will lead to Internet of Things.

10. Can enable deployment of secure network in Medicals.

11. By identifying light, it is possible to provide smart means of navigation.

Conclusion

Li – Fi is attracting a great deal of interest, as it is an efficient alternative of radio waves. If this technology is used, every bulb will work as Wi – Fi hotspots. It is less costly and provides higher data rate compared to Wi – Fi. We can say that future with Li – Fi is bright as data from laptops, smart phones or tablets can be transmitted through light in room using Li – Fi.

References


