Li-Fi Technology; the Communications of Future

Ali Soltani Sharif Abadi[1], Mohamadkazem Khosravani[2]
1- Department of Electrical Engineering, Technical College, Yazd University, Yazd, Iran
Email: a.soltanisharif@stu.yazd.ac.ir
2- Department of Electrical Engineering, Technical College, Yazd University, Yazd, Iran.
Email: mk.khosravani@stu.yazd.ac.ir

Received: January 2017 Revised: January 2017 Accepted: January 2017

ABSTRACT:
In this paper, we discussed about the history of Li-Fi technology and expressed about elements of Li-Fi technology briefly. In addition of above that will be discussed capabilities and objections of Li-Fi technology. At the end of this paper we will predict of Li-Fi technology future and communications future then will be compared the Li-Fi technology with Wi-Fi technology also will be compared the types of Li-Fi lamps.

KEYWORDS: Li-Fi, technology, wireless, network, data exchange.

1. INTRODUCTION

Nowadays has been immense using of wireless networks, Researchers always try to increase the speed of data exchanging in the wireless networks. Light waves, they are in the most of places and these waves are high speed, at finally they can use them for transmission of data.
Using of light waves for data exchanging been considered. Today efforts done on Li-Fi technology such as Mr. Haas and partners worked on introduction this technology to others and development of tools it [1]. Mr. Zhou and partners compared this technology with Wi-Fi technology [2]. Mr. Richard Gilliard had examined the types of Li-Fi lamps [3]. Analysis of area data rate with shadowing effects in Li-Fi and RF hybrid network worked in [4]. Mr. Hu and partners worked on prototyping and measurements for a Li-Fi system [5]. In this paper, we will be introduced the technology that can by it the exchanged data with high speed.

2. HISTORY OF THE LI-FI TECHNOLOGY

Li-Fi technology created in 2011 by Prof. H. Hass and confirmed by IEEE standardization committee in the same year. This technology of beginning found many fans, such that, with other technologies couldn't compare the rate of progression it. After coined of Li-Fi technology at TEDGlobal conference in 2011, Mr. Hass found pure lifi Company in 2012, in the same year this company began with the seed founding and promoted. At 2013, the first efforts done for promotion Li-Fi technology and completed the Li-Flame in 2014. At end they completed LiFi-X at 2015. In next section will be explained LiFi-X and Li-Flame [6].

3. PRESENTATION OF LI-FI TECHNOLOGY

The word of Li-Fi is abbreviation of light-fidelity. In a simple word, in Li-Fi technology information will be sent as light waves. In the Fig. 1 it has been shown that how it works Li-Fi technology.
In this technology by using of LED lamp information will be sent by Photo-Detector information will be received. In before of this part they were cited LiFi-X and Li-Flame and it was that be explained in this part, LiFi-X is one production of pureLiFi generates it that connects to any LED light, in Fig. 2 is shown a sample of LiFi-X and Li-Flame, that is the next production for Li-Fi technology.

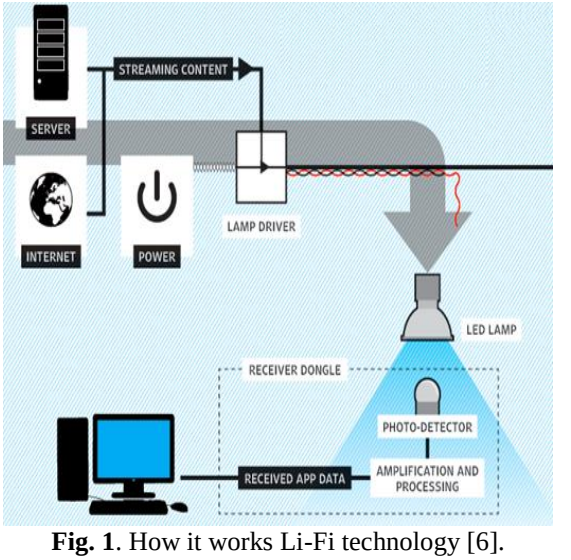

Fig. 1. How it works Li-Fi technology [6].

Fig. 2. One type of LiFi-X device [6]

4. CAPABILITIES AND OBJECTIONS OF LI-FI TECHNOLOGY

A number of capabilities and objections of Li-Fi technology will express and compare Li-Fi technology with Wi-Fi technology. A number of capabilities of Li-Fi technology are:

- Li-Fi technology is very simple for using.
- Li-Fi waves aren't harmful for humans.
- In Li-Fi technology, density of data is very high.
- The Interference phenomenon doesn't exist between Li-Fi waves.
- Using Li-Fi technology as light waves cause low power consumption.
- This technology, Li-Fi technology has high reliability.
- The Li-Fi technology has personalization capabilities.

This technology has another technologies objection that the following is number of these objections:

- the power of sun waves is very high that hasn't been expected to use this technology against of sun severing waves.
- Li-Fi waves haven't ability for crossing of things.
- Most receivers directly placed to expose the Li-Fi waves without annoying.
- For each place, this technology wants to use which should replace the tools of it instead of before them.

In continues, it has been compared Li-Fi technology with Wi-Fi technology results is shown in Fig. 3.

Li-Fi / Wi-Fi comparison

Parameter	Li-Fi	Wi-Fi
Speed	***	***
Range	*	**
Data density	***	*
Security	***	**
Reliability	**	**
Power available	***	*
Transmit/receive power	***	**
Ecological impact	*	**
Device-to-device connectivity	***	***
Obstacle interference	***	*
Bill of materials	***	**
Market maturity	*	***

* low ** medium *** high

Fig. 3. Comparing Results between Li-Fi and Wi-Fi [6]

5. FUTURE OF LI-FI TECHNOLOGY

With efforting that done in the field of promotion of Li-Fi technology, it can be expected the future of this technology hopefully. At the end types of LED lamps that use in this technology and they have been compared that the results of this comparing is shown in Fig. 4.

This technology has efficient abilities in many progressing. Li-Fi technologies will improve certainly in the future and these developments will cause many changing.

One of items of developable in Li-Fi technology is development of utilities of this technology and the others are introduction abilities of this technology.

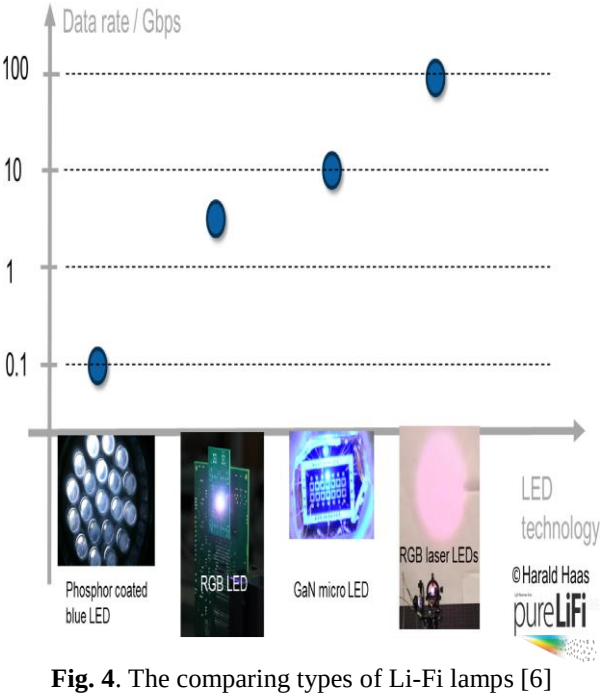

Fig. 4. The comparing types of Li-Fi lamps [6]

6. THE COMMUNICATIONS OF FUTURE BY USING LI-FI TECHNOLOGY

Many researches were done many researching on development of Li-Fi technology then they hope to conclude these researching. in the future all of industrial, they certainly need to high-speed wireless network.

As a result, one way of connecting between the industrial various sectors is using of light waves. In Li-Fi technology used light waves, so this technology had many abilities for connecting between the industrial various sectors. In networking, the types of connections can use Li-Fi technology.

According to the discussion of pervious section, if the RGB laser LEDs use in part of transmitter of Li-Fi technology, exchanging speed of data is very high. Furthermore, if they can be solved the objections of this technology then this technology becomes more singular.

In DCS networks, Li-Fi technology can use, if this work is done which increases the rate of data exchanging that this point makes faster than the connections.

7. CONCLUSION

In this paper, a review on Li-Fi technology is done and this technology compared with Wi-Fi technology. Also, the types of Li-Fi lamps were introduced and compared them together and the future of communications discussed by using of Li-Fi technology.

Moreover, the solutions were suggested for development of Li-Fi technology and checked out the capabilities and objections of this technology.

REFERENCES

[1] H. Haas, L. Yin, Y. Wang, C. Chen, **"What is LiFi?",** *IEEE Light wave Technology*, Vol. 34, Issue. 6, March. 2016, pp. 1533-1544.

[2] Z. Zhou, Z. Yang, C. Wu, and W. Sun, **"LiFi: Line-Of-Sight Identification with Wi-Fi",** *INFOCOM, 2014 Proceedings IEEE*, April and May. 2014.

[3] R. GILLIARD**,** "**The LiFi® lamp high efficiency high brightness light emitting plasma with long life and excellent color quality",** *Plasma Science, 2010 Abstracts IEEE International Conference on*, June, 2010.

[4] Y. Wang, X. Wu, and H. Haas, **"Analysis of Area Data Rate with Shadowing Effects in Li-Fi and RF Hybrid Network",** *Communications (ICC), 2016 IEEE International Conference on*, May. 2016.

[5] K. C. Hu, A. G. Armada, M. S. Fernandez, and A. Royo, **"Prototyping and Measurements for a LiFi System",** *Sensor Array and Multichannel Signal Processing Workshop (SAM), 2016 IEEE*, July. 2016.

[6] [Online]. http://purelifi.com/.