LiFi for Environment Sustainability:The Future of Telecommunication Industry

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***Abstract*—** In the present era of Telecommunication (Data transfer), the demand for more data is exponentially increasing; and this has resulted in increase in the deployment of telecommunication access networks. Some of the access technologies used are Satellite, FTTx (Home/ Curb/ Node/ Premises/ Distribution Point) and HFC (Hybrid Fiber Coaxial) Network. With the ones mentioned, they tend to meet the data demand criteria, but as a result, have a huge impact of the environment. With the advent of Light Emitting Diodes (LED) a new form of data transfer can be achieved; known as Visible Light Communication (VLC). Data transmission and reception is made possible by modulating the light intensity and decoding the received bits at the receiver using a photo-receptor. There are few variety of LED's which can be used in order to achieve different transfer rates, but the ones installed at our homes can also be used, with no alterations needed. This paper will describe the LiFi (Light Fidelity) VLC technology and how effectively it can be implemented without contributing to any environment load. In my opinion, based on facts and figures, I find this technology to be the key in achieving a sustainable development goal. However, the technology is in its infant-stage and much work will be needed to make it widely deployable in the market.

Keywords*—VLC (Visible Light Communication), LED (light emitting d Introduction, LiFi (Light Fidelity), HFC (Hybrid Fiber Co-axial), FTTx (Fiber to the x [different access systems]).*

I. INTRODUCTION

Using light as a correspondence medium was executed by Alexander Graham Bell in 1880 with his creation of the photograph telephone, a gadget that transmitted a voice motion on a light emission. The vibrating shaft was grabbed by the indicator at the getting end and decoded once more into the voice flag, the same strategy as the telephone did with electrical signs. However, Bell couldn't produce a valuable bearer recurrence, nor was he capable to transmit the light pillar from indicate point. Obstructions in nature, for example, haze and rain which could meddle with the photograph telephone made Bell stop any future research into his innovation. With the innovation of LED (Light Emitting Diode), using light as a correspondence medium has begun once more. VLC utilizes white Light Emitting Diodes (LED), which send information by glimmering light at rates imperceptible to the human eye. One noteworthy preferred standpoint of VLC is that we can utilize the framework around us without making any changes to it. LEDs' capacity to exchange data signals over (light which is between 400THz to 800THz of recurrence and whose wavelength is between 400nm to 700nm) makes it a decent correspondence medium. Thus LED lights used in our day to day life can now be used as a device to transfer data.

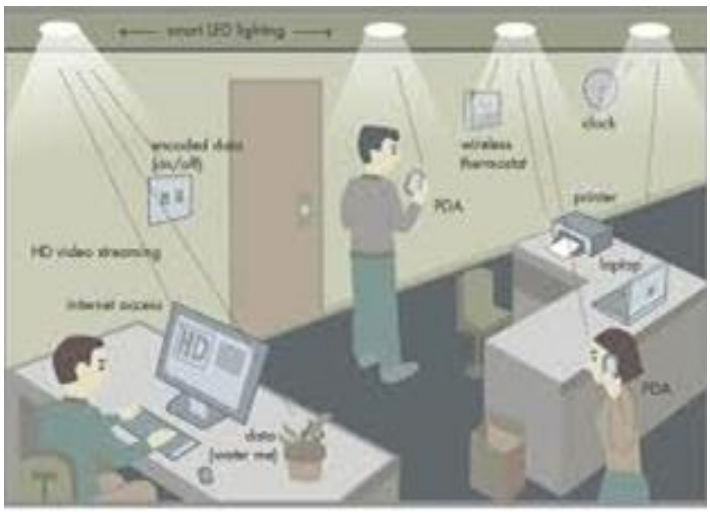

Fig. 1: Visible Light Communication **[4]**

II. LITERATURE REVIEW

Researchers have been trying to develop a technology which would not only meet the increasing demand for data, but also limit the use of energy. Such is the technology of Visible Light Communication, which seems to be very promising. In comparison with the florescent lights, LED are found to be more effective and have resulted in power saving across the globe. It is just about in time that we develop a method by which we may be able to extract the full potential of these lights. The current state of the art research suggests the use of LED's, in short transient time, which is achieved by turning the light on and off rapidly. Fast enough so that the human eye cannot make out the difference between a turned on and turned off light. With the help of a duplex communication system; the upstream and downstream will make use of two different frequencies. The added advantage of LED's is, they are less prone to the effect of noise on the bits of information, less bulky and extremely easy to install as compared to the rest of the access network technologies present in the market.

H. Elgal has pointed out the differences between Radio and Visible Light Communication and declared that Optical Wireless Communications can out-way the wired communication technology. Light Emitting Diodes can be deployed and data densities of 0.41 bits/second/Hz/m2 can be achieved. W.O. Popoola, S. Rajbhandari, M. Amiri, S. Hashemi [3], in this paper, they have proposed various balance methods and altogether talked about the advantages of an optical communication systems. Pulse Index Modulation (PIM) systems are known for their inalienable synchronization beat, subcarrier balance offers expanded throughput, versatility to the Inter Symbol Interference (ISI) and resistance against the glaring light commotion close DC, while Pulse Position Modulation (PPM) gives the unparalleled power effectiveness in Line of Sight (LOS) connects yet the execution corrupts extremely in scattered communication channel.

There has been important work in the examination of these and numerous more modulation techniques under various channels and system conditions, we however display here a brief summation of the wireless modulation techniques used in the Infra-red communication systems.
HU Guo-yong, CHEN Chang-ying1,2, CHEN Zhen-qiang [4], the likelihood of red light laser being utilized as flag light hotspot for Free-Space Optical (FSO) communication is proposed in this paper. In view of investigation of transmission in communication channel concerning 650 nm laser shafts, execution of remote laser communication interface using a low power red laser diode was assessed. The proposed framework can accomplish a greatest scope of 300 m at information rate 100 Mb/s hypothetically. A laboratory test at a short range provided an information rate of 10 Mb/s covering 300 m, and has been executed at a prototype level. It is attainable to upgrade the framework's performance, for example, link range and information rate by boosting up transmitting power and diminishing the divergence angle for laser's output.

Akassh, A. Mishra and Neelesh, S. Salian [5], in this paper, utilizationof Visible Light Communication is discussed, and is said that wireless communication is the need of great importance. It is one of the technologies that will reduce the pressure on environment and provide an eco-friendly technological solution. In the present quick paced life, there is a desperation for the change in the method for data communication. A Wireless system making use ofVisible Light Communication (VLC) is a recently developing technology. Such an innovation is helpful to imagine a more quick witted individual wireless communication system. Researches have explained the utilization of Low Power Light Emitting Diodes (LEDs) for transmission and gathering alongside the present and future prospects of this innovation. It likewise manages the specialized determinations for building such a system for constant purposes. In this examination, we found that visible light was undoubtedly a fabulous medium to transmit information. Since we made use of the low cost LED as our source, we scarcely had brought about much consumption to get the equipment segments.

III. USB PROTOCOL

The USB convention is totally not quite the same as RS-232 convention. For utilizing any gadget joined to the PC USB interface, the gadget must be perceived by the PC so that it awards consent to a COM port utilization for the gadget to handle. Allowing consent needs a USB ID. USB ID too called as gadget descriptor, is a distinguishing proof or a get to consent for any gadget to begin its operation with a PC [42]. The ID is perceived through the association, furthermore, the PC perceives the gadget then it permits the gadgets to work with it. UM232R is such a gadget it has a USB ID and can be utilized with any PC USB ports.

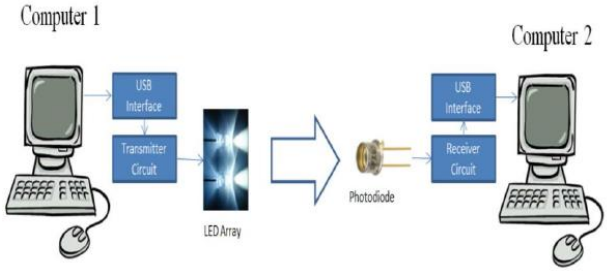

Fig.2: USM Communication for VLC**[2]**

In future, LEDs are relied upon to supplant all the lighting systems. VLC innovation concentrates on using the LEDs for lighting, as well as for data transfer. Numerous models have been proposed utilizing LEDs as interchanges implies in different applications, for instance, traffic lights for flagging [8], Internet access in a closed environment [7] and underwater communication utilizing remotely operated vehicles (ROVs) [9]. In view of the writing survey, a few techniques were considered for using VLC innovation when choosing how to continue with the proposal. This proposition work focuses on utilizing LEDs for indoor utilization. On the off chance that every one of the lights in our homes and workplaces are supplanted by LEDs, free space optical communication can then be accomplished. Wireless optical communication between PCs has been proposed for indoor applications. The proposed model is anything but difficult to execute, much the same as module gadgets that require no extra equipment.

IV. STATE OF THE ART TECHNOLOGY

Melbourne based organization NextLiFi, who have completed their stage one model with anotherwireless innovation in addition to Wi Fi know as Li-Fi are making solid advances towards commercializing the innovation as more secure, greener and no less than 100 times quicker than normal Wi-Fi speeds in business utilize. The organization is presently building up a half breed Li-Fi model to likewise be utilized as a part of conjunction with existing Wi-Fi systems empowering industry with a more secure and more effective contrasting option to transmitting expansive bundles of information while reducing the vitality costs on lighting by 70%. Innovative

work is additionally being led around sun powered and its uses close by Li-Fi and using Li-Fi with advanced mobile phones. They reported that their new gadget delivered a response at recurrence of 491 Megahertz and can transmit information at a rate of 2 billion bits for every second which is forty times quicker than as far as possible.

Like all present Li-Fi experimentation, models and early created items, despite everything they should be popularized and scaled to real business settings. The Li-Fi space however is moving quickly and we ought to soon observe the innovation as a major aspect of our everyday correspondences not long from now.

V. LIFI AND ECO - SUSTAINABILITY

With the advent of light fidelity technology, the future of telecommunication is surely going to be greener. LiFi is an innovation that has been in a procedure of improvement for a long while now. The motivation behind why it is so appealing is the boundless limit of visible light, which holds greater potential by a number of times than the radio signals. It holds the possibility to be considerably more vitality productive and way less expensive, exclusively due to the way of LED globules. Furthermore the infrastructural network to support the deployment of this technology is already in its place. Hence the technology will put less strain on the environment and therefore result in less carbon-foot prints as compared to any of the other telecommunication access technologies.

With the advancement of this innovation each globule (LED) can be utilized something like a hotspot to transmit remote information also, the globe will continue toward the cleaner, greener, more secure also, brighter future. In addition to this, the technology will limit the use of big battery backup equipment's and work more on passive devices, thus saving energy in the process.

VI. CONCLUSION

This innovation has a splendid extension in future. However, planning and execution of an effective and efficient network with the goal to achieve eco-sustainable technology can take years. With the government world over focusing on greener products and energy saving mechanisms, short term goals will evolve into long term plans; with more innovations taking place at a greater rate.Light Fidelity willprovides an answer for the issue of incorporating Visible Light Communication innovation with present framework, without making real changes to the network. Visible Light Communication is a quickly developing fragment inthe field of communication. There are numerous favorable circumstances in utilizing VLC. It will be capable to take care of a large number of the issues that individuals have been confronting for numerous years, power and environmental issues. VLC is still in its starting stages, however changes are being made quickly, and soon this innovation will have the capacity to be utilized as a part of our day to day lives. Regardless of the exploration issues it is our conviction that the VLC framework will get to be a standout amongst the most promising advancements for the future era in optical wireless communication.

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