Department of Electrical, Electronics, and Communication Engineering
GITAM School of Technology,
GITAM (Deemed to be University), Bengaluru, India

Extended Abstract PROJ3999 (Major Project)

Title: High speed 5G data transmission using LI-FI Technology
Project Supervisor: DR Subhashish Tiwari
Cluster Name (AI/ML, VLSI, Comm., CSP, Power Systems): Comm
Project Coordinator: Dr. Ambar Bajpai

(If Interdisciplinary, share details)

Mini Project (PROJ2999) Outcome: (Summary in 3-6 bullet points)

- The goal is to harness visible light for data transmission, offering an alternative to traditional Wi-Fi with enhanced bandwidth, reduced interference, and improved security.
- **Energy Efficiency:** Optimize the Li-Fi system for minimal energy consumption by utilizing LED lighting, which serves a dual purpose of illumination and data transmission, contributing to energy savings in smart buildings and other applications
- **Scalability and Flexibility**:. Create a modular and scalable architecture for Li-Fi that can be easily expanded to accommodate a growing number of users and devices, including support for IoT and smart city applications.

We have successfully built the LiFi model, achieving a data rate of up to 9600 bits/sec for transmission.

Extended Project Abstract (up to 300 words)

In this project, we plan to build a long-range, high-speed 5G Li-Fi model that can function in all types of indoor systems. We also intend to integrate audio and video transmission.

The exponential growth of data consumption in the digital era necessitates innovative technologies that can complement traditional communication systems. Light Fidelity (Li-Fi), an emerging wireless communication technology, leverages visible light for data transmission and offers unprecedented bandwidth and speed. Integrating Li-Fi with 5G networks presents a transformative solution to address challenges such as spectrum congestion, latency, and energy efficiency.

This study explores the potential of Li-Fi to enhance high-speed 5G data transmission, focusing on its ability to support ultrafast connectivity in environments where radiofrequency (RF) technologies face limitations. Key areas of investigation include the modulation techniques used in Li-Fi, the architecture of hybrid Li-Fi and RF systems, and the optimization of light sources such as LEDs for communication purposes.

We reffered some reasurch papers according to their Simulation and experimental results highlight the advantages of Li-Fi in achieving data rates exceeding 10 Gbps, reduced latency, and enhanced security, making it ideal for applications like autonomous vehicles, smart cities, and industrial automation. Challenges such as line-of-sight requirements, interference from ambient light, and integration with existing 5G infrastructure are also addressed, along with proposed solutions.

The findings underscore the transformative role of Li-Fi in complementing 5G technologies, paving the way for a robust, energy-efficient, and ultra-fast communication ecosystem. This research contributes to the ongoing discourse on next-generation wireless networks and their impact on future connectivity paradigms.

Department of Electrical, Electronics, and Communication Engineering
GITAM School of Technology,
GITAM (Deemed to be University), Bengaluru, India

Extended Project Objectives (up to 2-4 Bullet points)

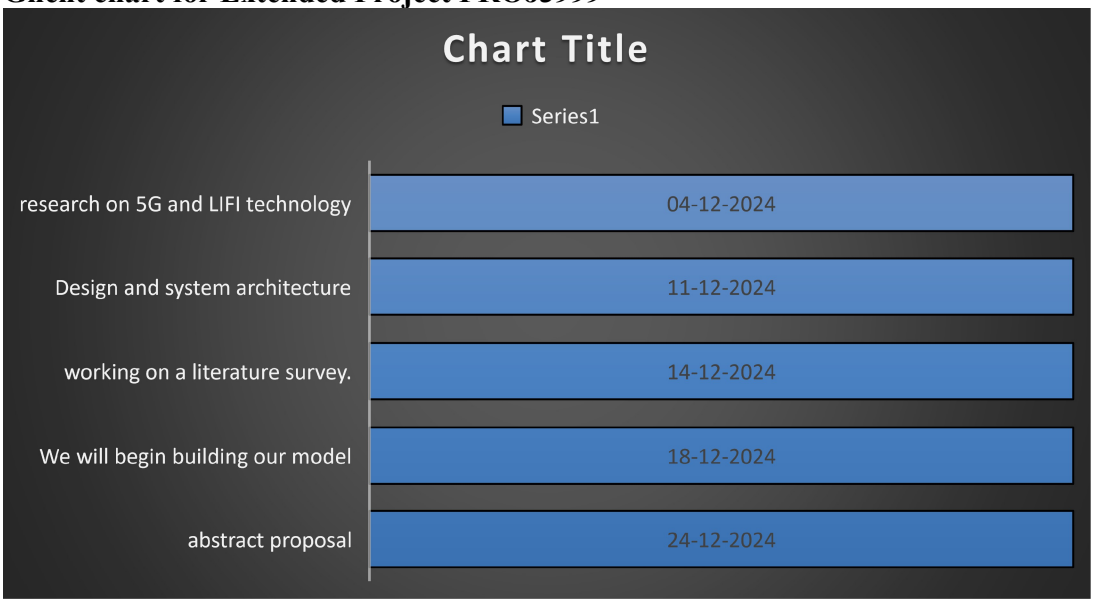
- **High-Speed Connectivity:** Achieving ultra-fast data transmission rates exceeding traditional wireless methods by leveraging visible light.

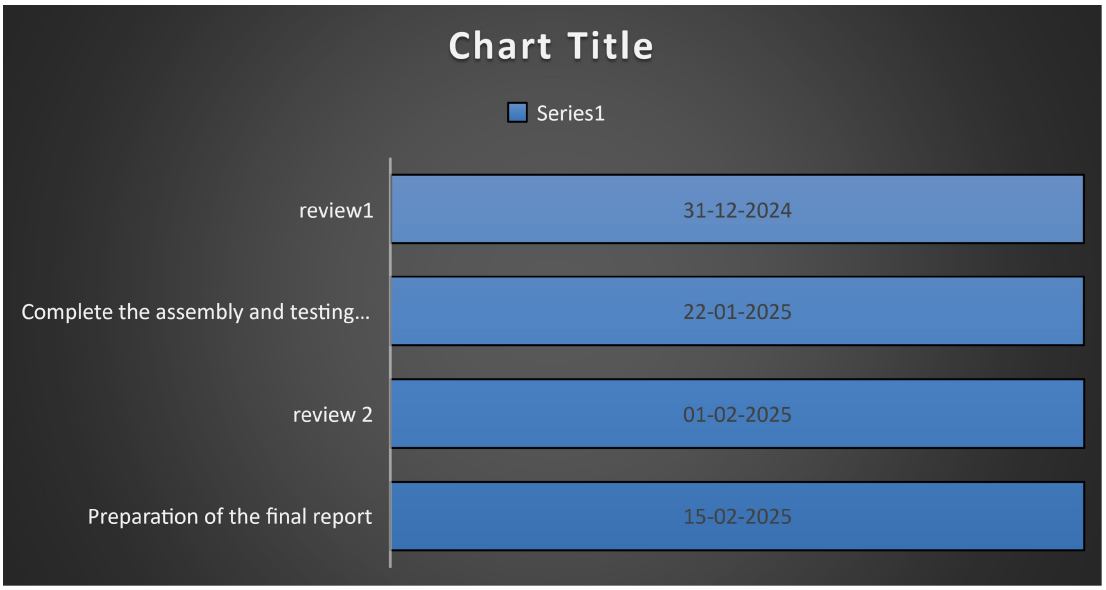
- **Spectrum Efficiency**: Reducing dependency on the congested radio frequency (RF) spectrum by utilizing a largely unused visible light spectrum.

- **Low Latency** :Minimizing communication delays to meet the demands of real-time applications such as gaming, remote surgeries, and autonomous vehicles.

- **Enhanced Security** :Providing secure communication channels as visible light cannot penetrate walls, reducing the risk of unauthorized access.

Ghent chart for Extended Project PROJ3999-





Department of Electrical, Electronics, and Communication Engineering
GITAM School of Technology,
GITAM (Deemed to be University), Bengaluru, India

Suggest 2 IEEE Conference targets-

1)Which LiFi's apps may fit mostly to 5G and beyond-5G Technology?
Written by Gila Albert

Affiliation

Faculty of Management of Technology

HIT - Holon Institute of Technology
HOLON, Israel

2) Measurements-Based Channel Models for Indoor LiFi Systems
Written by Ali Ghrayeb

Also published under: A. Ghrayeb, Ah Ghrayeb

Affiliation
College of Science and Engineering
Hamad Bin Khalifa University
Doha, Qatar

Group Details (Reg No., Name): Niranjan GN -BU21EECE0100485
chavva Hitesh reddy -BU21EECE0100499
Munendrakumar LK-BU21EECE0100572

Project Supervisor Name: DR Subhashish Tiwari

Sign with date