

ABSTRACT

Li-Fi (Light Fidelity) is an innovative wireless communication technology that utilizes visible light for high-speed data transmission. Unlike traditional Wi-Fi, which relies on radio frequency waves, Li-Fi employs LED lights to modulate and transmit data at rates potentially much faster than current Wi-Fi standards. This technology operates by modulating the intensity of light, imperceptible to the human eye, to encode binary data. The data is then received by photodetectors, which convert it back into electronic signals.

The primary advantages of Li-Fi include its vast bandwidth potential, energy efficiency, and enhanced security, as light does not penetrate walls, limiting access to the transmission area. This makes it ideal for applications in densely populated indoor environments, such as hospitals, offices, and airplanes, where Wi-Fi may be unreliable or restricted. Moreover, Li-Fi can support high-density data environments and integrate seamlessly with existing lighting infrastructure, enhancing connectivity options in smart city and IoT applications. However, challenges such as line-of-sight dependency, interference from ambient light, and limited outdoor usability must be addressed for widespread adoption. Li-Fi represents a promising alternative to traditional wireless communication, with potential to transform data transmission in secure and high-density settings.