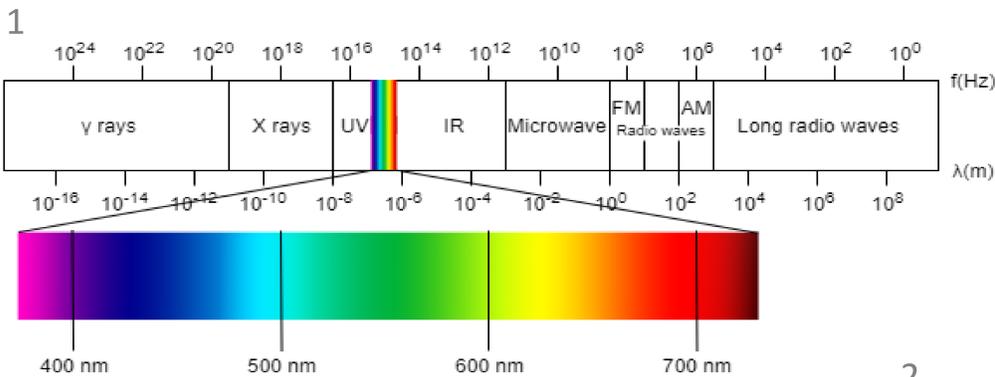


OWC (Optical Wireless Communication) represents the family of communication techniques using the visible light and infrared spectrums to transmit data. The term VLC (Visible Light Communication) technology is used when visible light transmits data. One implementation of such technology is Li-Fi (Light Fidelity) which aims to combine internet communication and lighting into one device in order to reduce energy consumption. This makes their introduction in smartcities relevant. Furthermore, with the growth in number and diversity of devices per capita, it will be necessary to release some of the RF spectrum to avoid the possible lack of wireless frequencies.

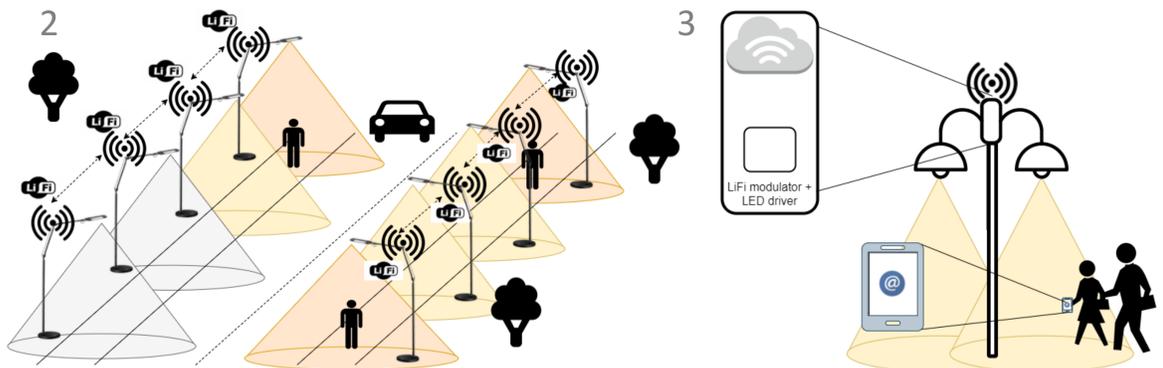


Benefits

The visible spectrum can be used to save some wireless bandwidth. Figure 1 shows that the visible light spectrum includes wavelength from 390 nm to 750 nm which represents 260 THz of unlicensed spectrum.

Aim of the project

The aim of this project is to study the feasibility of outdoor VLC systems such as smart lamppost capable of delivering relevant information to the end-user standing beneath it or street lights relaying information to each other using visible light. The foreseen system of lights would be interconnected in a mesh network and remotely manageable. Outdoor environment faces several issues, for instance the intensity of ambient light or weather conditions. Figure 2 illustrates the application of Li-Fi in secondary lanes and figure 3 shows a closer look of the hypothetical lamppost.

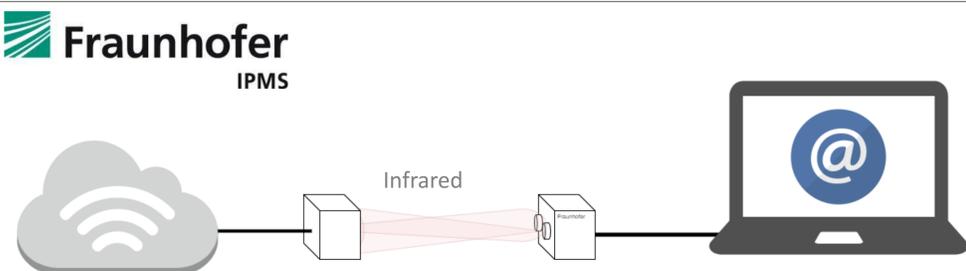


Applications

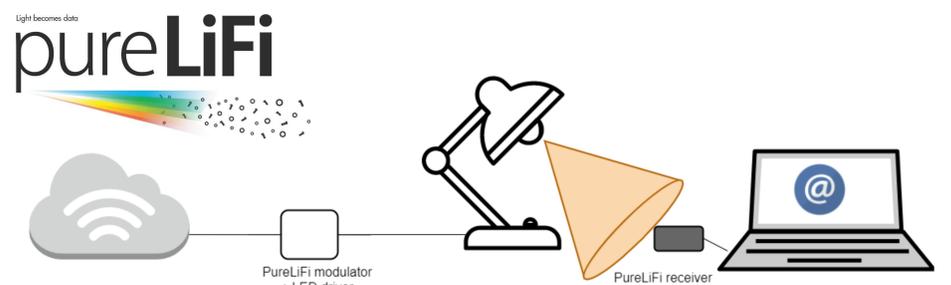
- Precise geolocation thanks to the knowledge of the position of the receiver/user under a network of lamps
- Internet connectivity in RF-sensitive places such as aircrafts and white rooms.
- Urban internet connectivity in crowded environment

Products

Among the LiFi products currently commercially available, two of them are being used. One using near Infrared light to transmit the data (created by Fraunhofer IPMS) and the other one, from the company pureLiFi, uses visible light to communicate.



Fraunhofer IPMS is a German research institute that develops the « Li-Fi HotSpot Evaluation kit » capable of transmitting up to 100 Mbit/s bidirectionally in Infrared. The system is composed of 2 Infrared emitter/receiver capable of communicating in both directions. There is one master and one slave to enable point-to-multipoint communication. Those devices maintain high performance within a range from 0,5 m to maximum 5 m indoor.



pureLiFi is a Scottish company founded by Dr Haas who coined the word Li-Fi. The firm sells Li-Fi products such as a Li-Fi access point which drives the LED lamp and a USB station which converts the visible signal into an electrical signal. The communication is bidirectional, and the uplink medium is infrared to avoid interference with the downlink but also for the end-user comfort. The system is functional when respecting a minimum distance of 1 m between the access point and the station and up to 6 m. The maximum bitrate is limited to 48 Mbit/s in both directions.