Fraunhofer
IPMS

LiFi – Optical wireless communication

LiFi Development Journey

KEY FACTORS

What are the requirements?

- Physical Environment
- Transmission Distance
- Data Rate
- Alignment
- Interfaces

Which solution best fits requirements?

- Li-Fi GigaDock®
- Li-Fi HotSpot

Which components are most suitable for the requirements?

- Optics
- Transceivers
- Modules

How are Li-Fi modules quickly and successfully implemented?

- Interfaces
- Form Factor
- Environmental Conditions

How to purchase Li-Fi modules?

SERVICES

Consulting

- Technology Consulting
- Requirement Workshops

Concept

- Feasibility Study
- Concept Design
- Proof of Concept
- Simulation
- Evaluation Kits

Hardware Design

- Optic Design
- Transceiver Design
- Demonstrators & Prototypes

Module Design

- Plug In Module Design
- Implementation Consulting
- Sample Kits
- Design Review & Support

Li-Fi Module Supply

- Prototypes
- Pilot Series
- Technology Transfer

Li-Fi GigaDock® Evaluation Kits

Transceiver Type	*Data Rate*
GD-1G	*≤ 1 Gbit / s*
GD-5G	*≤ 5 Gbit / s*

Li-Fi Hotspot Evaluation Kits

Transceiver Type	*Data Rate*
HS-1G Point to Point	*≤ 1 Gbit / s*
HS-1G Point to Multipoint	*≤ 1 Gbit / s*

Data links for automated guided vehicles

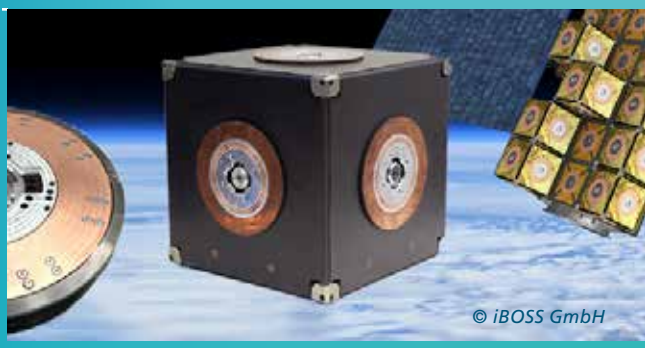
Multiple parallel participants in a radio-based network can cause interference and ultimately affect the reliability of data links. Li-Fi provides wireless and secure data links for moving equipment without interferences to establish a reliable alternative solution to Wi-Fi links.

Contactless Rotary Joints

Data interfaces between rotating and static components are one of the biggest challenges in data transmission. Rotary joints are often used to meet this challenge. Contact-based rotary joints often reach their limits due to materials, while contactless solutions are either very cost-intensive, prone to interference or low in data rate. Li-Fi GigaDock® transceivers can transmit data rates of up to 5 Gbps contactlessly and in 360-degree rotation, making them well suited for use as rotary transceivers.

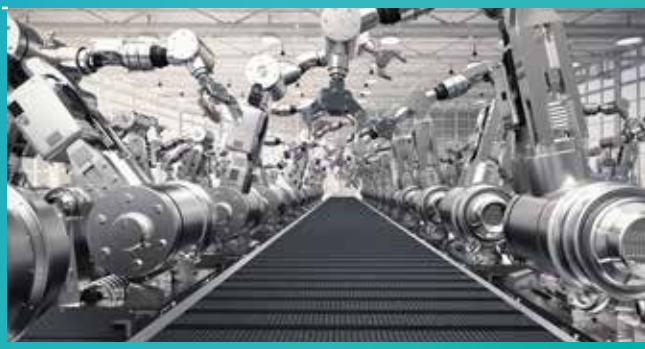
Sustainable satellites using Li-Fi GigaDock® transceivers

The Li-Fi GigaDock® is part of the space interface iSSI® (intelligent Space System Interface) developed by the iBoss GmbH that ensures data transfer between individual satellite modules. The interface makes satellite systems more sustainable since individual components can be replaced in space.
The core of the technology is an optical wireless transceiver that enables contactless full-duplex and bidirectional data transmission with a data rate of up to 5 Gbps.



Machine to Machine Communication

Due to low latency, a Li-Fi communication channel is very well suited for machine-to-machine interaction. The system offers robustness and low energy consumption, as well as strong data security.



Cables and connector replacement

In many cases, wireless systems offer better reliability and security than provided by expensive special cables or connectors. Connectors can be mechanically fragile and contacts often become bent or loose. In addition, connectors can be plugged only a limited number of times.

LiFi – Optical Wireless Communication

Light Fidelity (Li-Fi) technology wirelessly transmits data via light using a transmitter to switch a light-emitting diode (LED) on and off so fast, that it is not noticeable by humans. A photodiode on the receiver side absorbs the light, and transforms it into electrical impulses. Li-Fi offers various benefits in comparison to RF-based communication:

- Quick wireless data transfer
- Real-time communication
- High data security due to necessary line of sight
- No interference

LiFi – Hotspot

Transmitting data over long distances, the Li-Fi HotSpot provides a suitable alternative to WiFi or cable networks. Like a WiFi hotspot, several users can simultaneously dial in to the network. Because light does not penetrate walls, a Li-Fi connection offers data security significantly better than that of RF-based network accesses.

- Data rate up to 1 Gbps
- Range up to 300 m
- Uni- and bi-directional, full-duplex
- Real-time capability
- Point-to-point, point-to-multipoint
- Cell-hopping / Roaming

LiFi – Gigadock®

The Li-Fi GigaDock® uses light to provide high-speed data links over short distances. In the context of Industry 4.0, it is a good fit for industrial applications. Due to its low latencies, Li-Fi GigaDock® can also be used in applications with real-time requirements.

- Data rate up to 12.5 Gbps
- Range up to 10 cm
- 360 ° rotatable
- Size down to 5x5x5 mm³
- Uni- and bi-directional, full-duplex
- Real-time capability with latency <1µs
- Point-to-point data transmission

Short Profile

Based in Dresden, Fraunhofer IPMS is your research and service partner in the fields of optical sensors and actuators, integrated circuits, micro-systems (MEMS/MOEMS) and nanoelectronics. As one of the currently 76 independent institutes and research units making up the Fraunhofer-Gesellschaft, the leading European organization for near-industrial research, our more than 400 scientists work together with both private industrial and service companies as well as the public sector in projects to directly benefit business and society.
To meet the high standards of our customers, Fraunhofer IPMS is certified by DEKRA in accordance with DIN EN 9001:2008 for the research, development and manufacturing of microsystems, respective semiconductor and microsystems processes as well as integrated actuators / sensors. We support companies in realizing their innovative ideas in the field of wireless data transmission using Li-Fi solutions. Our services include technology consulting and simulation, as well as concept, hardware, and module design. We have extensive experience in application-oriented research and development, especially in the areas of analog and digital circuit design, optic design and module integration, in addition to protocol controller and electrical interfaces. Fraunhofer IPMS is therefore able to provide complete and comprehensive assistance from idea to prototype production and pilot series.

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