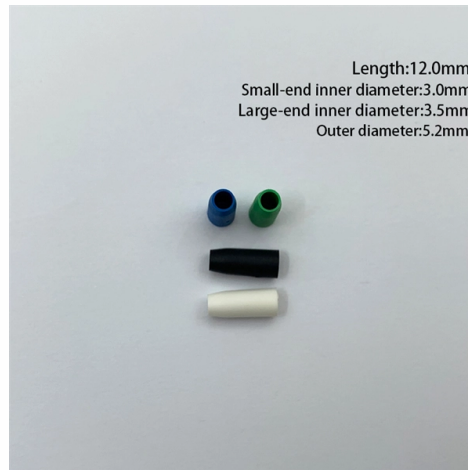


Optical Communication Wireless Transmission Equipment



Overview

Optical Wireless Communication | Springer Nature Link This chapter systematically summarizes the development status, system composition, and key technologie.

Key Takeaways

Optical wireless communication (OWC) equipment includes transmitters, receivers, and optical components that enable high-speed data transmission using visible, infrared, or ultraviolet light without fiber cables. Key Components of Optical Wireless Equipment

Transmitters: These typically use LEDs or laser diodes to emit light signals. In visible light communication (VLC), white LEDs can simultaneously provide illumination and data transmission, while infrared lasers are used in free-space optical (FSO) systems for long-range links . **Receivers:** Photodetectors such as PIN diodes or avalanche photodiodes (APDs) capture the optical signals. APDs are preferred for high-gain, high-speed applications, including space optical communication . **Optical Multiplexers/Demultiplexers:** Wavelength Division Multiplexing (WDM) components allow multiple wavelength channels to be transmitted simultaneously, increasing data throughput . **Drivers and Signal Processing Circuits:** LED or laser drivers modulate the light source, while electronic circuits process the received signals to recover the transmitted data .

System Configurations



OWC systems can be configured in various topologies:

- Point-to-Point: Direct LOS communication, often used in FSO backhaul links with data rates up to 10 Gbps per wavelength .
- Point-to-Multipoint: One transmitter communicates with multiple receivers, suitable for indoor VLC networks.
- Ring or Mesh Networks: Used in complex indoor or vehicular networks to enhance coverage and reliability .

Applications

- Indoor VLC: Wireless LANs, conference rooms, and aircraft cabins using LEDs for simultaneous lighting and data transmission .
- Vehicular Networks: Car-to-car or Car2X communication using visible or infrared light .
- Backhaul Links: FSO systems provide high-speed links between base stations, reducing RF spectrum congestion .
- Space Communication: High-speed satellite-to-satellite or satellite-to-ground links using lasers, with challenges like solar interference and precise alignment .
- Underwater OWC: Using blue/green light for short-range underwater communication .

Advantages of Optical Wireless Equipment

- High Data Rates: Optical spectrum offers hundreds of THz, enabling very high-speed communication .
- Security: Optical signals do not penetrate walls, reducing eavesdropping risks .
- Unlicensed Spectrum: Unlike RF, optical frequencies are largely unregulated, allowing global deployment .
- Complementary to RF: OWC can relieve congested RF networks and provide additional bandwidth .

Limitations

- Line-of-Sight Dependency: Directed systems require clear LOS; obstructions can disrupt communication .
 - Atmospheric Sensitivity: Weather, smoke, or dust can affect outdoor FSO links .
 - Alignment Challenges: Especially critical in space or long-range terrestrial links .
- Optical wireless communication equipment is rapidly evolving, with ongoing research in photonic integrated circuits, advanced modulation schemes, and adaptive beam steering to enhance performance and reliability across diverse environments .

Article Content

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This chapter systematically summarizes the development status, system composition, and key technologies of optical

Optical Wireless Communication–Recent Progresses and Future ...

Abstract: The tutorial covers the recent progresses and future perspectives on optical-wireless-communication (OWC)

Optical data transmission | Leuze

Optical data transceivers are the right choice for any application where data needs to be transmitted without cables and without

Classification of Wireless Optical Communication Systems: A

The diagram uploaded gives a clear classification of wireless optical communication systems, splitting them into

Multi-target and ultra-high-speed optical wireless communication using ...

In this contribution, we propose and demonstrate a multi-target and ultra-high-speed OWC system based on a thin

Optical Transmission

A series of MS-OTN transmission equipment that supports TDM, packet, and OTN services over a metro or campus optical network,

What Is Optical Communication?

Optical communication systems utilize light for data transmission, significantly improving bandwidth and security while

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Optical wireless communication is an emerging wireless communication technology, which has faster transmission

Optical Transmission

Optical transmission is defined as the process of transmitting information using light signals, which is integral to various

Optical wireless communication systems

The emerging field of optical wireless communication (OWC) systems is seen as potential complementary technology

Fiber-optic communication

Due to these difficulties, early fiber-optic communication systems were primarily installed in long-distance applications, where they

Optical Wireless Communications

Optical Wireless Communications Optical wireless communications (OWC) is an optical communication technology that provides

Optical Transmission System

Optical transmission systems refer to systems that transmit signals over fiber optic cables, enabling long-distance communication

5G wavelength-division-multiplexing-based bidirectional optical ...

Integrating fifth-generation signals with optical wireless communication systems provides promising ways to afford

Optical Wireless Communication Systems, A Survey

Index Terms— Optical wireless communication (OWC) system, indoor optical wireless systems, IRC, VLC. I. INTRODUCTION T

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Optical wireless communication (OWC) is a powerful data transmission technology due to the availability of its vast

Transmitters and Receivers for High Capacity Indoor Optical Wireless ...

The optical spectrum offers huge bandwidth, which enables high-capacity transmission. Very high data rates are

A Comparative Survey of Optical Wireless Technologies:

Abstract— New high-data-rate multimedia services and applications are evolving continuously and exponentially increasing the

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