

# High-speed optoelectronic connection for dedicated power grids is anti-electrostatic tracking

## Article Overview

High-speed optoelectronic connections in power grids use optical transmitters and receivers to provide noise-immune, high-bandwidth communication while protecting control electronics from electrostatic and electromagnetic interference.

### High-Speed Optical Links in Power Grids

Modern power grids increasingly rely on high-speed optical communication to connect control systems, sensors, and power electronics. Technologies such as Plastic Optical Fiber (POF) combined with advanced optical transmitters and receivers (e.g., Firecomms Redlink®) enable robust galvanic isolation, which prevents ground loops and protects sensitive electronics from electrical noise and transients in harsh industrial environments . These optical links support high data rates, low power consumption, and wide temperature operation, making them suitable for Smart Grid applications, HVDC systems, and power-to-x stations .

### Anti-Electrostatic and EMI-Resistant Design

Optical communication inherently provides immunity to electrostatic discharge (ESD) and electromagnetic interference (EMI) because the signal is transmitted as light rather than electrical current. This property effectively functions as anti-electrostatic tracking, ensuring that high-speed data transmission remains stable even in environments with strong electrical disturbances . By isolating the control electronics from high-voltage components, optical links prevent damage from voltage spikes and reduce the risk of signal degradation.

### Role of Photoelectric Tracking Systems

Photoelectric tracking systems complement high-speed optical links by providing precise alignment and stabilization of optical paths. These systems use coarse and fine tracking axes to maintain high bandwidth and low tracking error, even under mechanical vibrations or environmental disturbances . In power grid applications, such tracking ensures that optical signals remain accurately aligned, further enhancing reliability and reducing susceptibility to electrostatic or electromagnetic disruptions....

## Article Content

Sep 25, 2025

Optoelectronic Oscillators: Progress from Classical Designs to ...

Optoelectronic oscillators (OEOs) have emerged as indispensable tools for generating low-phase-noise microwave and millimeter-wave signals, which are critical for a variety of high

Mar 23, 2026

Advances in Two-Dimensional Materials for Optoelectronics ...

The past one and a half decades have witnessed the tremendous progress of two-dimensional (2D) crystals, including graphene, transition-metal dichalcogenides, black phosphorus,

Aug 10, 2025

IEEE Power Electronics Society

This roadmap seeks to identify the research and technology developments in high-power electronics and digital technologies for future net-zero energy systems. ITRG is currently seeking volunteers to join

Mar 20, 2026

High-speed optoelectronic devices

In this paper, we present our work on high-speed optoelectronic devices, including high-performance distributed feedback (DFB) semiconductor lasers and integrated light sources, wideband electro

Mar 02, 2026

Optoelectronic mixing with high-frequency graphene transistors

It offers absorption at telecom wavelengths, high-frequency operation and CMOS-compatibility. We show how high speed optoelectronic mixing can be achieved with high frequency

Dec 14, 2025

High-speed optoelectronic devices | Science China ...

Back-illuminated modified uni-traveling-carrier photodetectors (MUTC-PDs) with high saturation power and bandwidth exceeding 100 GHz were developed. Applications of high-speed

Feb 24, 2026

## Eye tracking and eye expression decoding based on transparent

Eye tracking systems are crucial for eye health-monitoring and human-machine engineering. Here, Shi et. al. report a transparent and flexible active eye tracking system based on

Jul 24, 2026

## Rationale and Challenges for Optical Interconnects to Electronic Chips

With large numbers of high-speed, low-power devices attached in this way, many benefits become possible for optical interconnects, including several that were not significantly exploited in long

Nov 03, 2025

## Advancing flexible optoelectronics with III-nitride ...

Rooted in superior material properties, III-nitride flexible optoelectronics thrive across flexible applications via advanced material growth and transfer processes.

Aug 16, 2025

## Special Issue on Advanced Ultra-High Speed Optoelectronic Devices

High speed photodetectors operating at a telecommunication band (from 1260 to 1625 nm) have been well studied with the development of an optical fiber communication system.

Feb 18, 2026

## Optical Interconnect

This technology enables high bandwidth data transmission while reducing issues related to electronic parasitics and space limitations associated with traditional bond wires.

Feb 19, 2026

## Silicon photonics for high-speed communications and photonic signal ...

Their high-speed signal optical processing capabilities can also be used for computing, sensing, and medical diagnostics, showcasing the versatility and potential of photonic technologies.

Jun 03, 2026

## Integrating silicon photonics with complementary metal-oxide ...

Showed that germanium detectors grown directly on silicon can work at high speed and low cost, making them the standard choice for receiving light signals in silicon photonic chips.

Sep 13, 2025

#### High-Efficiency Laser Wireless Power Transfer System with Automatic ...

Wireless power transfer for sensors in high-voltage direct current (HVDC) grids is crucial for smart grid, however stable and efficient energy delivery to moving targets remains a challenge. This paper

Feb 26, 2026

#### Photonics with hexagonal boron nitride | Nature Reviews Materials

Hexagonal boron nitride (hBN) is highly sought after for mid-IR nanophotonics, nonlinear and quantum optics, and as an efficient UV emitter. This Review surveys its fundamental physical

Sep 18, 2025

#### Holistic Co-Design of Electronics and Photonics for High-Speed

The photonic integrated circuit described in this section is fabricated in Rockley Photonics multi-micron Si-photonics platform, which is an EAM-based high-speed platform optimized for high density

May 05, 2026

#### Optical Interconnect

Optical interconnects refer to the use of light emitters and detectors to facilitate communication between integrated circuits, allowing for chip-to-chip or board-to-board connections without the need for

Dec 01, 2025

#### IEEE Xplore

IEEE Xplore, delivering full text access to the world's highest quality technical literature in engineering and technology. | IEEE Xplore

Jan 10, 2026

#### High-speed optoelectronic devices | Request PDF

Abstract High-speed optoelectronic devices are key components of modern fiber communication systems, and the backbone of information technology.

Apr 16, 2026

#### The Integration of CMOS Process-compatible Optoelectronic

This project aims to solve the packing-compatible problem by a fully embedded board-level optoelectric interconnection system, which could provide high-speed optical communication within one board. All

Dec 22, 2025

#### Special Issue on Advanced Ultra-High Speed Optoelectronic Devices

This has been a strong driver of the development of high-speed light sources and detectors for emerging applications. In addition, these ultra-fast optoelectronic devices have come to

Oct 14, 2025

#### Enabling High-Speed Galvanic Isolation in Smart Grids and Power

This article describes how Plastic Optical Fiber (POF), combined with Firecomms Redlink® optical transmitters and receivers, enables high-speed, noise immune optical bridges

Feb 10, 2026

#### Advances in High-Speed Opto-Electronic Circuits and Transmitter ...

An overview of opto-electronic integrated circuits intended for upcoming optical access network systems is provided. Photonic integrated circuits for access applications and associated front-end electronics

Nov 29, 2025

#### Special Issue on Advances in Photoelectric Tracking Systems: An

Quantum and laser communication systems, which are based on the photoelectric tracking system, are able to create high-speed data transmission channels with great flexibility that

Nov 23, 2025

#### Optical interconnect research program

Optical links provide increased bandwidths, longer reaches, and lower latencies compared to electrical links. It's why they're widely used in datacenters, where data movement between processing units

Sep 30, 2025

#### Optoelectronics'' quantum leap: Unveiling the breakthroughs driving high ...

Optoelectronics is essential in providing the high-resolution displays, motion tracking, and depth sensing required for these applications. The versatility of optoelectronics is evident across a

Mar 20, 2026

## High-speed optoelectronic devices

High-speed optoelectronic devices are key components of modern fiber communication systems, and the backbone of information technology. In this paper, we present our work on high-speed devices

## Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: <https://www.iiss.co.za>

Email: [sales@iiss.co.za](mailto:sales@iiss.co.za)

Phone: +27 63 174 2895

Address: Unit 8, Innovation Park, 15 Rivonia Road, Sandton, Johannesburg, 2196, South Africa

This document is for informational purposes only. Specifications subject to change without notice.

