Principle of Polarization Extinction Ratio Tester



Overview

PER is an important performance parameter for systems or devices which require that light propagating through them remain linearly polarized and aligned to a particular axis.

Key Takeaways

A polarization extinction ratio (PER) tester measures the polarization extinction ratio and polarization angle of polarization-maintaining fibers or components, using a rotating polarizer and photodetector for precise alignment and characterization.

Overview

A polarization extinction ratio tester is an optical instrument designed to quantify the degree of linear polarization in a light beam, expressed as the ratio of maximum to minimum transmitted power through a polarizer. It also measures the polarization angle, which is critical for aligning polarization-maintaining (PM) fibers, connectors, and laser diodes. These devices are widely used in fiber optic component testing, PM fiber pigtailing, and quality assurance for optical systems.

Operating Principle

Most PE

R testers operate using a rotating polarizer in front of a photodiode detector. The photodiode measures the input light intensity as the polarizer rotates: Peak power occurs when the polarizer aligns with the input polarization axis. Minimum power occurs when the axes are perpendicular.

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The ratio of peak to minimum power determines the polarization extinction ratio. Unpolarized or circularly polarized light produces a low extinction ratio near 1, indicating minimal linear polarization contrast. Some instruments also measure insertion loss (IL) or output power simultaneously, and can handle single or multi-channel devices for high-throughput testing.

Key Features and Specifications

Wavelength Range: Many testers cover 400 nm to 2500 nm, with specific models optimized for 400–700 nm, 600–1600 nm, or 1200–2500 nm (Thorlabs ERM2xx, Agiltron PERM). Dynamic Range: High-end models like FIBERPRO ER2200 and Luna ERM-202 offer up to 50 dB dynamic range. Connector Compatibility: FC/PC, FC/APC, LC/PC, SC/PC, and bare fiber adaptors are commonly supported.

Automation: Devices like Santec PEM-400 allow automated multichannel measurements, measuring a 12-fiber DUT in under 30 seconds. Data Interface: Many testers provide USB, GPIB, or RS232 connections for remote operation and data logging. ApplicationsPM Fiber Alignment: Ensures proper orientation of polarization axes during fiber pigtailing or connectorization.

Component Testing: Measures PER and insertion loss of PM components, fiber array units, modulators, and laser diodes. Quality Assurance: Used in manufacturing of PM couplers, polarization beam splitters, and fiber gyros. Research and Development: Characterizes polarization properties in optical experiments and photonics labs.

Popular Models

Thorlabs ERM2xx: Benchtop PER meters with monitor output for active alignment, covering 400–2500 nm. Santec PEM-400: High-speed multichannel PER tester for FAUs and ELSFPs, capable of automated measurements.

FIBERPR

O ER2200: 50 dB dynamic range, GPIB/RS232 interface, suitable for polarization axis alignment.

Agiltron PER

M: Push-button operation with GUI, measures PER and misalignment angle, supports bare fiber adaptors. Luna ERM-202: Rotating-polarizer PER meter with single or dual channel, 50 dB dynamic range, high-resolution angle measurement. These instruments provide fast, accurate, and repeatable measurements essential for both laboratory research and high-volume production environments.

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Article Content

An Overview of Polarization Extinction Ratio Measurement Methods

PER is an important performance parameter for systems or devices which require that light propagating through them remain linearly polarized and aligned to a particular axis. In such cases, the PER

Polarization Extinction Ratio Measured Using Laser Light

The extinction ratio of an optical component under test (DUT) can be measured using light from a laser or other linearly polarized source, but it is often necessary to insert a linear polarizer

Polarization Extinction Ratio Meter

A polarizer is rotated in front of a high-speed power meter to measure PER up to 30 dB and angle of polarization. The insertion loss (IL) of passive components or the output power of active components

Luna: An Overview of Polarization Extinction Ratio

It is defined as the ratio of the power in the principal polarization

Polarization Extinction Ratio (PER) | Fibercore

The extinction ratio simply compares the optical power held on the wanted axis to that which is on the unwanted axis, the orthogonal polarization state, expressed in decibels (dB).

Microsoft Word

This measurement is performed with a polarization analyzer while shifting the phase difference between the orthogonally polarized modes from 0o to 360o. This simultaneously identifies the orientation of

Polarization Extinction Ratio Measurement Methods and Applications

Polarization extinction ratio (PER), a measure of the degree to which light is confined in a principal linear polarization mode, is an important performance parameter for many lasers and for PM

Polarization Extinction Ratio Measurement Using CUBE-ER100

Polarization Extinction Ratio (PER) of a PM Fiber. When light transmits in a polarization maintaining (PM) fiber, it can be considered as a superposition of two orthorgonal linearly polarized lights. One is

Automated Polarization Extinction Ratio Measurement |Inline

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Demo Video This video demonstrates an easy, fast, and accurate way to measure the polarization extinction ratio (PER) of a bare polarization maintaining (PM) fiber.

Luna: An Overview of Polarization Extinction Ratio

Polarization extinction ratio (PER) is a measure of the degree to which light is confined in a principal linear polarization mode.

Definition, meaning, and measurement of the polarization extinction ...

Denis Penninckx and Nicolas Beck We clarify the definition of the polarization extinction ratio—also called polarization cross talk—of fiber-based devices.

The Importance of Measuring Polarization Extinction

The ratio between the total optical power of the signal on the SOP on which it is supposed to propagate and the total optical power on the orthogonal is referred

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APPLICATION NOTE ON POLARIZATION EXTINCTION RATIO (PER) MEASUREMENT Polarization extinction ratio (PER), as specified in our product specification sheets, is measured with respect to

Research on High-Precision Measurement Technology of the Extinction ...

With the widespread application of optical technology in numerous fields, the polarization performance of transmissive optical components has become increasingly crucial. The extinction

Extinction Ratio | MEETOPTICS Academy

A linear polarizer allows maximum transmission of linearly polarized light when the polarization of the incident beam is parallel to the axis of the polarizer. The transmission is minimum when these are

Measuring Extinction Ratios on Purity Polarizers

Keywords: extinction ratio, high purity polarizers, polarization measurement, Glan-Thompson polarizers, dichroic glass polarizers, Ultra Broadband Polarizers,

Polarization Extinction Ratio Measured Using Laser Light

Insights Feedback Can a linearly polarized light source be used to measure the extinction ratio of a polarizing optic? The extinction ratio of an optical component under test (DUT)

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In most applications for PM fiber, only one of the two polarization orientations (states) is used - this is sometimes called the ''wanted'' polarization-state. The extinction ratio simply compares the optical

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