Maximum permissible error of optical power meter

Article Overview

The maximum power error of an optical power meter typically ranges from +-2% to +-5% depending on calibration, wavelength, linearity, and sensor type, with high-precision systems achieving uncertainties as low as 0.02%.

Factors Affecting Maximum Power Error

Calibration Uncertainty: The primary contributor to error is the calibration of the sensor against a reference standard, often traceable to national standards like NIST. Calibration uncertainty depends on the power level, wavelength, and type of sensor used, and is typically specified by the manufacturer . Linearity: Optical power meters may exhibit nonlinearity when measuring powers different from the calibration point. For thermal and pyroelectric sensors, the linearity error is usually +-2% and must be added to the calibration uncertainty . Wavelength Dependence: Sensors have varying absorption across wavelengths. Broadband sensors may have +-5% variation, while metallic absorbers can have larger deviations. Using the closest calibration wavelength minimizes this error, but additional wavelength-dependent errors may need to be included in the total error budget . Pulse Rate and Temporal Effects: For pulsed lasers, pyroelectric sensors can show pulse rate dependence, and source stability during measurement can introduce additional errors . Connector and Fiber Effects: When measuring through optical fibers, reflections from connectors and fiber interfaces can artificially increase readings. Calibration should ideally be performed with the same fiber and connector configuration to minimize this effect . Detector Drift and Aging: Over time, photodiodes (Si, Ge, InGaAs) can drift due to temperature cycling, humidity, and usage, potentially increasing error by +-0.2-0.3 dB after a year of use .

High-Precision Systems

Advanced calibration systems, such as the Laser Optimized Cryogenic Radiometer (LOCR), can achieve combined standard uncertainties of 0.02% or less, providing extremely low maximum power error for laboratory-grade measurements .

Estimating Total Maximum Error

To estimate the total maximum power error, combine the following contributions:

o Calibration uncertainty
o Linearity error
o Wavelength-dependent error
o Pulse rate or temporal effects

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o Connector/fiber-induced errors
o Detector drift These errors are typically combined using root-sum-square (RSS) methods for independent uncertainties or added linearly for worst-case scenarios . Summary: For standard optical power meters, the maximum power error is generally +-2-5%, while high-precision laboratory instruments can achieve 0.02% uncertainty. Users must account for calibration, wavelength, linearity, pulse rate, and fiber/connector effects to determine the total expected error in their measurements.

Typically both transmitters and receivers have receptacles for fiber optic connectors, so measuring the power of a transmitter is done

We describe a system for measuring the response nonlinearity of optical fiber power meters and detectors over a wide power

This application note demystifies how EXFO"s IQS-12002 Optical Calibration System can guide you through the calibration of power

1. Introduction Since optical fiber power meters (OFPMs) are a very common type of optical test equipment, NIST has developed and

The magnitude of this effect is a function of both wavelength and connector type, and, as a result, the optical power meter should be

Get everything you need to know about an optical power meter including its types, applications and fiber optic power

An optical power meter (OPM) is a device used to measure the power in an optical signal. The term usually refers to a device used

Unfortunately, determining the measurement uncertainty of different sensors can be difficult. Not only are there several different

primarily on these wavelengths. Other optical power meter users (e.g., compact-disc player manufacturers, users of erbium-doped

Thorlabs This part of the instruction manual contains every specific information on how to handle and use the PMxxx Optical Power

When using a commercial power meter, it is important to ensure that uncertainty associated with the

instrument lies within an

Fiber Optic Measurement Units: "dB" and "dBm" Whenever tests are performed on fiber optic networks, the results are displayed on

Both norms list Maximum Permissible Errors as the only quality data to be fulfilled by manufacture and proper use, i.e.

Fluke Networks sets the standard in network testing with its advanced range of fiber optic power meters and fault locators, designed

Experts define the Maximum Permissible Error as the threshold of measurement error an instrument must not exceed for its

Receive powers can be as low as -36 dBm in systems that use an optical pre-amplifier. In

Web: https://bssoda.pl