

Columbia optical attenuator withstands low temperatures



Overview

Low Temperature Resistives | Spectrum ControlFamily of coaxial and chip solutions for cryogenic and other low temp applications, providing superior perform.

Key Takeaways

Columbia optical attenuators are designed for precise signal attenuation, but their low-temperature tolerance is not explicitly specified; standard optical fibers and attenuator components typically operate reliably down to -40°C , while extreme cryogenic applications require specialized designs.

Operating Principles and Temperature Considerations

Columbia optical attenuators, such as the OVA-50 Optical Variable Attenuator, are used to precisely reduce optical signal power at wavelengths including 1310, 1490, 1550, and 1625 nm, and are suitable for various testing and measurement scenarios. These devices work by absorbing or deflecting light within the fiber, and their performance depends on both the optical components and the fiber itself. Optical fibers, which form the core of these attenuators, generally maintain stable signal transmission down to -40°C .

Below this threshold, the fiber's polymer coatings and buffer tubes may become brittle, and trapped moisture can freeze, potentially causing microbending or increased attenuation. Therefore, standard attenuators are expected to function reliably in typical cold environments, such as outdoor installations in polar or high-altitude regions, but may not be suitable for extreme cryogenic conditions without specialized design.

Extreme Low-Temperature Applications

For applications requiring operation at cryogenic temperatures (millikelvin to a few kelvin), standard optical attenuators are insufficient. Specialized low-temperature attenuators, such as those used in quantum computing or aerospace, employ cryogenic-compatible materials and thin-film resistive technology to maintain performance down to 4 mK. These designs ensure temperature-stable operation and prevent thermal noise, which is critical for sensitive measurements.

Practical Recommendations

For typical low-temperature environments (down to -40°C), Columbia optical attenuators should perform adequately, assuming proper fiber handling and environmental protection. For extreme cryogenic conditions, consider custom attenuators designed for low-temperature operation, as standard optical attenuators may experience mechanical stress or signal degradation. Always verify the manufacturer's datasheet or contact Columbia directly for precise operating temperature specifications if your application involves temperatures below standard industrial ranges.

In summary, while Columbia optical attenuators are robust for standard cold environments, their use in extreme low-temperature or cryogenic applications requires careful consideration of fiber and component materials, or the selection of specialized low-temperature attenuators.

Article Content

Low Temperature Resistives | Spectrum Control

Family of coaxial and chip solutions for cryogenic and other low temp applications, providing superior performance at temperatures as low as 4 mK. Design kits or

Attenuators

Our attenuators are wavelength insensitive, which means they operate with minimal changes in attenuation when used in either the C-Band or the L-Band and exhibit low return loss.

Attenuators

A passive electronic device that reduces the power of an electrical or optical signal without significantly distorting its waveform.

Microwave attenuators for use with quantum devices below 100 mK

Table I summarizes the parameters for our final design, which gave the lowest effective noise temperature at the attenuator output consistent with the materials, fabrication and design constraints.

Optical Attenuators – fixed, variable, VOA, high-power,

An optical attenuator is a device used to reduce the optical power of a light beam. The amount of attenuation is often specified in decibels or as an optical density.

Optical attenuator

An optical attenuator, or fiber optic attenuator, is a device used to reduce the power level of an optical signal, either in free space or in an optical fiber. The basic types of optical attenuators are fixed, step

Optical Attenuators – Buyer's Guide & Supplier List | RP Photonics

This buyer's guide for optical attenuators provides technical background, comparison of major types, selection criteria, and an overview of suppliers.

Cryogenic RF Attenuators | SMA Cryo Attenuators for Quantum

These ultra-low VSWR, superior-flatness attenuators provide continuous, reliable operation at temperatures approaching absolute zero. Engineered to minimize self-heating, which can introduce

Fixed Attenuators/Terminations

Mini-Circuits' fixed attenuators, packaged in rugged plug-in and connector models, are available in both 50- and 75-ohm models ranging from 1 to 40 dB spanning DC to 1500 MHz.

Attenuators | Authorized Distributor

Shop Arrow for attenuators from leading industry manufacturers including Huber Suhner, Analog Devices, TE Connectivity, Amphenol ICC and more. We have a large selection of fixed, variable,

LC/APC Fixed Optical Attenuator

Introduction: An optical attenuator is a passive device, used to reduce the power of an optical signal. Our LC/APC single mode attenuators can handle a maximum of 1 watt of optical input power. This device

The Ultimate Guide to Fiber Optic Attenuators

Fiber optic attenuators play a crucial role in managing and controlling the power levels of optical signals in fiber optic networks. They are passive

The Ultimate Guide to Optical Attenuators

Dive into the world of Optical Attenuators, exploring their principles, types, and applications in various fields, including telecommunications and laser technology.

VARIABLE OPTICAL ATTENUATOR (ULTRA LOW LOSS VOA)

Variable Optical attenuators are commonly used to test optical parameters by temporarily adding a calibrated amount of signal loss, or installed permanently to properly match a fixed power signal.

Fixed Attenuators/Terminations

The important parameters associated with fixed attenuators include the amount of attenuation, the flatness over a specified frequency, range, VSWR, average and peak power-handling capability, size

Attenuators | OZ Optics Ltd.

Our attenuators are wavelength insensitive, which means they operate with minimal changes in attenuation when used in either the C-Band or the L-Band and exhibit low return loss. In addition, all

Design and fabrication of all-polymer thermo-optic variable optical ...

In this paper, an all-polymer thermo-optic variable optical attenuator (VOA) based on Mach-Zehnder interferometer (MZI) waveguide structure was designed and fabricated on PMMA

Silicon thermo-optic variable optical attenuators based on

We experimentally demonstrate silicon variable optical attenuators (VOAs) based on thermally tunable Mach-Zehnder interferometers (MZIs). Thermo-optic tuning is enabled by a silicon

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

