

Single-Mode Spectral Attenuation Measurement Method



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Optical
Fiber

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Scope

This information describes the current reference method for measuring the spectral attenuation of Corning® single-mode optical fibers.

General

The measurement of attenuation, or power loss, is one of the most fundamental and important parameters in optical fiber. Attenuation is the result of a variety of scattering and absorption mechanisms, and is wavelength dependent. Since single-mode optical fibers are designed to operate over a wide range of wavelengths, the attenuation measurement is performed as a function of wavelength, typically between 1200 nm and 1625 nm.

Measurement Methods

Spectral attenuation is measured by the cutback method. A narrow spectral pulse of light is launched into the full length of fiber and the transmitted intensity is measured at the wavelengths of interest. The measurement is repeated for the first two meters of the same fiber without disturbing the input end of the fiber. The optical power exiting the two meter section of fiber is then used as the reference input power for the long length of fiber. The attenuation rate is calculated by taking the ratio of the output power to the input power and normalizing for length as follows:

$$\text{Attenuation Rate } (\lambda) = \frac{-10}{L} \log_{10} \left[\frac{P_L(\lambda)}{P_S(\lambda)} \right] [\text{dB/km}]$$

where: P_L = power exiting the long length of fiber; P_S = power exiting the 2 meter length of fiber; L = fiber length in km

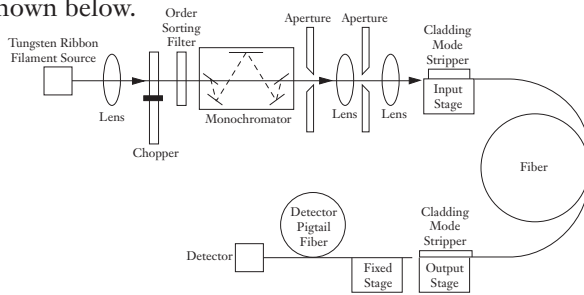
Measurement Conditions

The fiber is wound with near zero tension onto a large diameter (≥ 36 cm) measurement spool to provide a measurement condition which will not influence the accuracy of the measurement result. The fiber ends are stripped of coating and prepared with end angles less than 2° with near perfect mirror surfaces. Mode stripping is provided to assure the removal of cladding modes.

- Fiber Length Full length and 2.0 ± 0.2 meters
- Launch Spot Size 200 μm
- Launch Numerical Aperture 0.20
- Source Spectral Width ≤ 10 nm Full Width at Half Maximum (FWHM)
- Measurement Wavelengths 1200 nm to 1625 nm in 5 nm steps and 1361 to 1419 nm in 2 nm steps for the water peak

Apparatus

The apparatus used to measure the spectral attenuation of Corning® single-mode optical fibers is shown below.



References

(FOTP-78) Spectral Attenuation cutback Measurement for Single-Mode Optical Fibers.

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