

# Core Diameter Measurement Method



**CORNING**  
Discovering Beyond Imagination

Optical  
Fiber

## MM22

Issued: September 2001  
Supersedes: March 2000  
ISO 9001 Registered

### Scope

This information describes the current reference method for measuring the optical core diameter of Corning® multimode fibers.

### General

Core diameter is the geometrical measure of the diameter over which optical power is carried in a multimode fiber. It is calculated from the near-field optical power distribution exiting from two meters of fiber. The core diameter is important to the functionality of multimode fibers. Mismatches in core diameter may cause excess loss at fiber joints.

### Measurement Description

The measurement consists of launching a narrow spectral band of light into the fiber and measuring the transmitted near-field intensity distribution emitted from the end of the fiber. A filament white light source is used to create the angularly, spatially and uniformly overfilled launch condition, which is required for consistent measurement results. The detector aperture and detector are stepped linearly across the distribution so that the intensity versus position is measured. The data is normalized to the peak intensity and the center point of the measurement distribution is computed

as the weighted mean and represents the center of the fiber. The intensity data from the 10 to 80 percent relative intensity points is then fitted using the equation below, which represents the power distribution profile in the near field. The core diameter is equal to 2a.

$$I(r) = I_0 \left[ 1 - \left( \frac{r}{a} \right)^\infty \right]$$

where:  $I(r)$  = transmitted near-field data as a function of the radial position

$I_0$  = peak intensity

$a$  = core radius

$\infty$  = shape parameter (approximately = 2) for graded index multimode fibers

$r$  = radial distance from the center of the near-field distribution

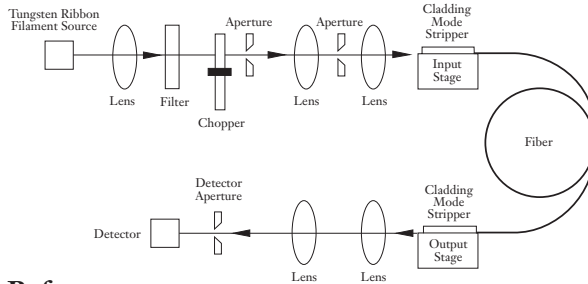
### Measurement Conditions

Two meters of fiber are loosely deployed with no bends less than 36 cm in diameter 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: 2.0 ± 0.2 meters
- Launch Spot Size: ≥ 100 μm
- Launch Numerical Aperture: ≥ 0.30
- Source Spectral Width: ≤ 100 nm Full Width at Half Maximum (FWHM)
- Measurement Wavelength: 850 ± 10 nm

### Apparatus to Measure Core Diameter

The apparatus used to determine the core diameter of Corning® multimode fibers is shown below.



### References

EIA/TIA-455-58A (FOTP-58), Core Diameter Measurement of Graded-Index Optical Fibers, Method C, Option 2.

EIA-455-43 (FOTP-43), Output Near-Field Radiation Pattern Measurement of Optical Waveguide Fibers.

### Corning Incorporated www.corning.com/opticalfiber

One Riverfront Plaza  
Corning, NY 14831  
U.S.A.

Phone: 800-525-2524 (U.S. and Canada)  
607-786-8125 (International)

Fax: 800-539-3632 (U.S. and Canada)  
607-786-8344 (International)

Email: info@corningfiber.com

#### Europe

Berkeley Square House  
Berkeley Square  
London W1X 5PE  
U.K.

Phone: 00 800 2800 4800 (U.K.\*, Ireland, France,  
Germany, The Netherlands, Spain and Sweden)  
\*Callers from U.K. dial (00) before the phone number

00 800 781 516 (Italy)

+44 7000 280 480 (All other countries)

Fax: +44 7000 250 450

Email: europe@corningfiber.com

#### Asia Pacific

Australia  
Phone: 1-800-148-690  
Fax: 1-800-148-568

Indonesia  
Phone: 001-803-015-721-1261  
Fax: 001-803-015-721-1262

Malaysia  
Phone: 1-800-80-3156  
Fax: 1-800-80-3155

Philippines  
Phone: 1-800-1-116-0338  
Fax: 1-800-1-116-0339

Singapore  
Phone: 800-1300-955  
Fax: 800-1300-956

Thailand  
Phone: 001-800-1-3-721-1263  
Fax: 001-800-1-3-721-1264

#### Latin America

Brazil  
Phone: 000817-762-4732  
Fax: 000817-762-4996

Mexico  
Phone: 001-800-235-1719  
Fax: 001-800-339-1472

Venezuela  
Phone: 800-1-4418  
Fax: 800-1-4419

#### Greater China

Beijing  
Phone: (86) 10-6505-5066  
Fax: (86) 10-6505-5077

Hong Kong  
Phone: (852) 2807-2723  
Fax: (852) 2807-2152

Shanghai  
Phone: (86) 21-6361-0826 ext. 107  
Fax: (86) 21-6361-0827

Taiwan  
Phone: (886) 2-2716-0338  
Fax: (886) 2-2716-0339

E-mail: luyc@corning.com

Corning is a registered trademark of Corning Incorporated, Corning, N.Y.

©2001, Corning Incorporated