

Erbium-Doped Fiber

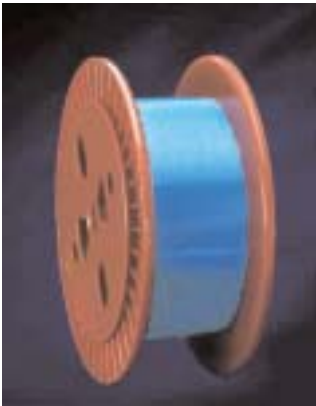
High Performance Fibers for Superior Amplifier Design



Leading Optical Innovations

Specification Sheet

Description



Erbium-doped fiber is a critical component for the amplification of optical transmission signals. OFS offers a complete line of erbium-doped fiber to meet your specific requirements for C- and L-Band amplifiers, as well as ASE Sources. OFS Specialty Photonics Division has been developing and manufacturing its line of erbium-doped fiber since the onset of erbium-doped fiber amplifier (EDFA)

technology. Our market-leading fibers have been used in amplifiers and systems deployed throughout the world. With state-of-the-art production facilities and advanced R&D from OFS Labs, our fiber technology has been a proven market leader. All of our erbium-doped fiber products meet the most stringent standards for performance and reliability. Our consistent record of high-volume delivery is proof of our dedication to helping customers realize their goals. Together with our OASiX® Optical Amplifier Simulation System, an experienced and knowledgeable customer support staff can help you to determine which OFS erbium-doped fiber is best for you.

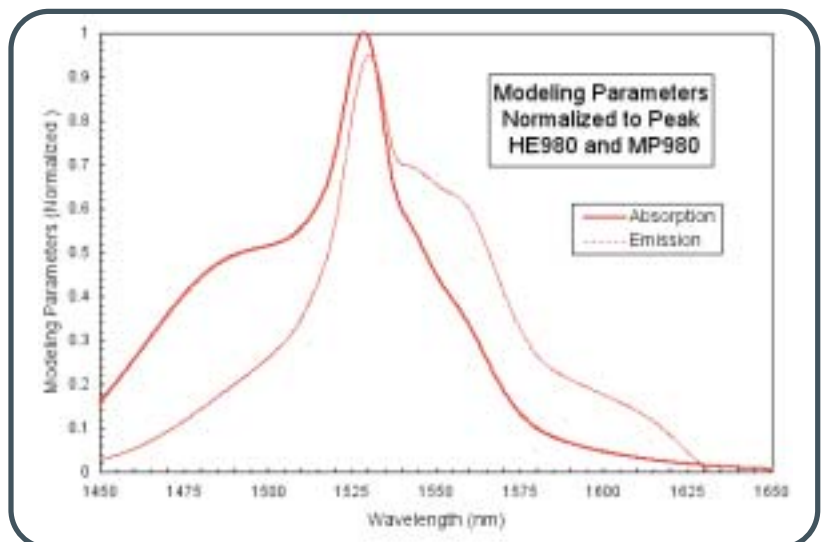
Enabling Superior Amplifier Design

Applications and performance requirements vary throughout the industry. That's why OFS offers a wide range of erbium-doped fibers, so designers can select the fiber that leads to an optimal design for their application. A variety of fibers are manufactured by the Specialty Photonics Division to offer advantages such as gain flatness, high efficiency in a range of pump powers, and low noise figure. Fibers are available for power amplifier, in-line amplifier, or pre-amplifier configurations in the C- or L-Band.

All of our erbium-doped fiber goes through a rigorous qualification program to ensure the optical and physical characteristics meet the specifications set. It is important to understand the optical performance of the fiber such as its efficiency, noise figure, and spectral gain shape when selecting from OFS' line of fibers. Our erbium-doped fiber specialists can help in your fiber choice, with the added assurance that it will provide the performance needed for your applications.

OASiX® Software Package

The Specialty Photonics Division offers OASiX, the Optical Amplifier Simulation System, which models the performance of OFS erbium-doped fiber in accurate design simulations. This software package, featuring an enhanced user interface, allows the simulation of EDFAs to predict which fiber type is best for your application. ASE sources and laser designs are also incorporated in this proprietary software package. Using setup conditions specified by the user, the simulated designs performed by OASiX can save you valuable measurement time and reduce fiber waste. OFS continues to issue new releases of OASiX to keep pace with the evolving needs of EDFA designers.



Benefits

- **Gain Flatness** – Broader and flatter gain spectra are achievable with high aluminum levels, making fibers more suitable for DWDM and CATV applications.
- **Uniformity** – Fiber uniformity means guaranteed low variability within fiber lots and repeatable performance from lot to lot, simplifying EDFA design and manufacturing.
- **Low Polarization Mode Dispersion** – Low PMD allows the fibers to perform in high data rate applications.
- **High Power-Conversion Efficiency** – Fibers are optimized to provide maximum efficiency within various pump-power operating ranges. Efficiencies of 83% are achievable.
- **High Reliability** – OFS' silica-based fibers are inherently highly reliable. For ultra-high reliability applications, fibers can be processed for increased protection against hydrogen-induced losses.
- **Splicing** – parameters available upon request.
- **Experience and Delivery** – OFS is unmatched in the experience of delivering high performance erbium-doped fibers in high volumes to the general market. Customers appreciate the commitment we bring to serving their needs now and in the future.

Our preform manufacturing can be tailored to meet specific targets within our set ranges for a more customized design. All of our erbium-doped fiber has consistently met and exceeded performance, reliability, and quality expectations. We strive to lead design innovation in high performance fibers for present and future application needs.

Qualification Programs

Our test and measurements team performs a thorough analysis to determine the optical performance, physical characteristics, and modeling parameters of each fiber. In addition, all our fibers must meet a splice qualification criteria that confirms low loss splicability to industry-standard pigtail fibers.

Dual Design and Production Facilities

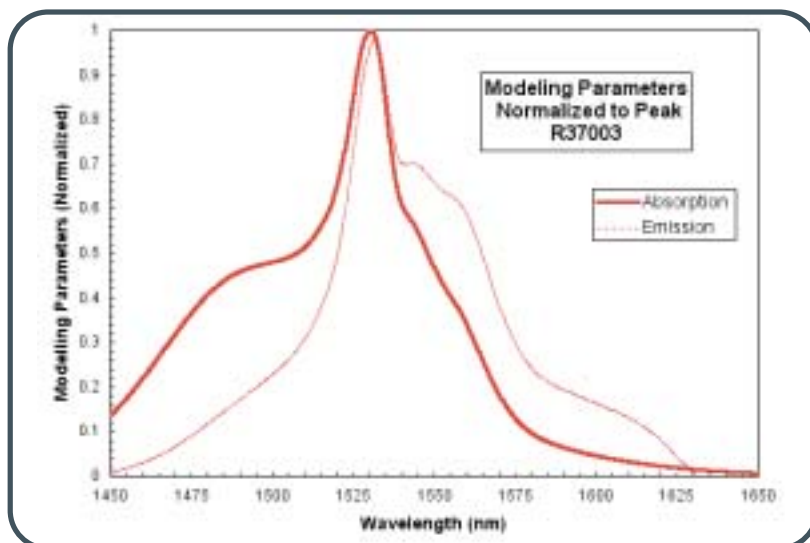
As a specialty optical fiber vendor, OFS has the added advantage of two state-of-the-art locations producing erbium-doped fiber; one in Somerset, NJ, and another in Denmark. Each have highly experienced staff collaborating on continued development, manufacturing, and support of erbium-doped fibers. Both locations have successfully used their own advanced design and processing techniques to consistently meet customer needs around the world. With dual sources, OFS customers have more fiber choices, and enjoy the added benefit of a readily available second source, a key factor when relying on supply for a critical, high-performance fiber product.

Commitment to Our Customers

The Specialty Photonics Division is determined to help customers realize their goals by offering enhanced product development. New fiber designs for increased bandwidths are being refined to offer even more options for extended flat gain bands.

Ordering Configurations

Our team would like to make the purchase and the use of our fiber as easy as possible. We offer several ordering options for our erbium-doped fiber including bulk fiber delivery, fiber spools or coils cut to specific design lengths, fiber coloring, and more. Our production staff aims to allow efficient and economic use of our fiber in your design and manufacturing processes.



Fiber Specifications

Erbium-Doped Fiber for C-Band Applications					
Data by Part Number	HE 980	MP 980	HP 980	R37003	R37004
Optical Properties					
Peak absorption near 1530 nm	2.5 - 4.5 dB/m	5.0 - 7.0 dB/m	3.5 - 5.5 dB/m	6.0 - 8.0 dB/m	6.0 - 8.0 dB/m
Numerical aperture	0.28 ± 0.02	0.23 ± 0.02	0.18 ± 0.02	0.27 ± 0.01	0.23 ± 0.01
Mode-field diameter ¹	3.6 - 5.2 μm	4.9 - 6.3 μm	6.0 - 9.0 μm	4.4 - 5.4 μm	5.2 - 6.6 μm
Typical polarization mode dispersion	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m
Maximum polarization mode dispersion	0.01 ps/m	0.01 ps/m	0.01 ps/m	0.006 ps/m	0.006 ps/m
Loss at 1200 nm	<15 dB/km	<5 dB/km	<3 dB/km	<10 dB/km	<10 dB/km
Cutoff wavelength	800 - 960 nm	800 - 960 nm	800 - 960 nm	840 - 960 nm	850 - 960 nm
Dimensions/Geometric Properties					
Co-dopants	Ge/Al	Ge/Al	Ge/Al	La/Al	La/Al
Aluminum content (M%) Typical	12	12	6	8	8
Cladding diameter	125 ± 2 μm	125 ± 2 μm	125 ± 2 μm	125 ± 0.7 μm	125 ± 0.7 μm
Coating diameter	250 ± 10 μm	250 ± 10 μm	250 ± 10 μm	245 ± 10 μm	245 ± 10 μm
Coating/cladding concentricity error	15 μm	15 μm	15 μm	16 μm	16 μm
Core concentricity error	0.3 μm	0.3 μm	0.3 μm	0.3 μm	0.3 μm
Proof test level	2%	2%	2%	2%	2%
	(200 kpsi)	(200 kpsi)	(200 kpsi)	(200 kpsi)	(200 kpsi)
Comcode	107 528 366	107 770 935	107 528 382	107 993 263	107 993 263

Data by Part Number	Erbium-Doped Fiber for L-Band Applications			Erbium-Doped Fiber for Source Applications	
	EDF-LSL	EDF-LRL	R37103	HG 980	R37005
Optical Properties					
Peak absorption near 1530 nm	15 - 20 dB/m	27-33 dB/m	16 - 24 dB/m	8 - 14 dB/m	15 - 25 dB/m
Numerical aperture	0.25 ± 0.02	0.25 ± 0.02	0.25 ± 0.02	0.29 ± 0.02	0.28 ± 0.02
Mode-field diameter ¹	4.7 - 5.7 μm	4.7 - 5.7 μm	4.9 - 5.9 μm	3.6 - 5.2 μm	4.4 - 5.4 μm
Typical polarization mode dispersion	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m	<0.002 ps/m
Maximum polarization mode dispersion	0.01 ps/m	0.01 ps/m	0.006 ps/m	0.01 ps/m	0.02 ps/m
Loss at 1200 nm	<10 dB/km	<10 dB/km	<10 dB/km	-	-
Cutoff wavelength	1100 - 1400 nm	1100 - 1400 nm	850 - 980 nm	800 - 950 nm	800 - 1200 nm
Dimensions/Geometric Properties					
Co-dopants	Ge/Al	Ge/Al	La/Al	Ge/Al	La/Al
Aluminum content (M%) Typical	-	-	-	-	-
Cladding diameter	125 ± 2 μm	125 ± 2 μm	125 ± 0.7 μm	125 ± 2 μm	125 ± 2 μm
Coating diameter	250 ± 10 μm	250 ± 10 μm	245 ± 10 μm	250 ± 10 μm	245 ± 15 μm
Coating/cladding concentricity error	15 μm	15 μm	16 μm	15 μm	16 μm
Core concentricity error	0.3 μm	0.3 μm	0.3 μm	0.3 μm	0.5 μm
Proof test level	2%	2%	2%	2%	2%
	(200 kpsi)	(200 kpsi)	(200 kpsi)	(200 kpsi)	(200 kpsi)
Comcode	108 729 864	109 108 910	108 729 872	107 528 974	107 993 271

¹ Petermann II Def.

Fiber Specifications

80 μm Erbium-Doped Fiber for C-Band Applications				
Data by Part Number	HE980	MP980	R37003	GP980
Optical Specifications				
Peak absorption @ 1530 nm	2.5-4.5 dB/m	5-7 dB/m	6-8 dB/m	8-12 dB/m
Cutoff wavelength	800 - 960 nm	800 - 960 nm	800 - 960 nm	800-960 nm
Mode field diameter ¹	4.4 \pm 0.8 μm	5.6 \pm 0.7 μm	4.4 - 5.4 μm	5.4 \pm 0.6 μm
Loss @ 1200 nm	<15 dB/km	<5 dB/km	<10 dB/km	<15 dB/km
Numerical aperture	0.29 \pm 0.02	0.23 \pm 0.02	0.28 \pm 0.02	0.25 \pm 0.02
Dimensions/Geometric Properties				
Co-dopants	Ge/Al	Ge/Al	La/Al	Ge/Al
Cladding diameter	80 \pm 1 μm	80 \pm 1 μm	80 \pm 1 μm	80 \pm 1 μm
Core concentricity error	0.3 μm	0.3 μm	0.5 μm	0.5 μm
Coating diameter	175 \pm 10 μm	175 \pm 10 μm	200 \pm 15 μm	175 \pm 10 μm
Proof Test	2% (200 kpsi)	2% (200 kpsi)	2% (200 kpsi)	2% (200 kpsi)
Comcode	300378726	300378718	-	300378759

¹ Petermann II Def.

Fiber Specifications

80 μm Erbium-Doped Fiber for L-Band Applications			
Data by Part Number	LSL	LRL	R37102
Optical Specifications			
Peak absorption @ 1530 nm	15 - 20 dB/m	27 - 33 dB/m	16 - 24 dB/m
Cutoff wavelength	1100 - 1400 nm	1100 - 1400 nm	800-960 nm
Mode field diameter ¹	5.2 \pm 0.5 μm	5.2 \pm 0.5 μm	4.9 \pm 0.5 μm
Loss @ 1200 nm	<10 dB/km	<10 dB/km	<10 dB/km
Numerical aperture	0.25 \pm 0.02	0.25 \pm 0.02	0.28 \pm 0.02
Dimensions/Geometric Properties			
Co-dopants	Ge/Al	Ge/Al	La/Al
Cladding diameter	80 \pm 1 μm	80 \pm 1 μm	80 \pm 1 μm
Core concentricity error	0.3 μm	0.3 μm	0.5 μm
Coating diameter	175 \pm 10 μm	175 \pm 10 μm	200 \pm 15 μm
Proof Test	2% (200 kpsi)	2% (200 kpsi)	2% (200 kpsi)
Comcode	300378742	300378734	-

¹ Petermann II Def.



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