SPECIALTY OPTICAL FIBER

IXF-RAD-SM-1550-014-PI

Radiation Hardened Single Mode Fiber

Radiation hardened optical fibers are designed to mitigate the effects of Radiation Induced Attenuation (RIA) and extend the fiber's lifetime when used in radiative environments. Leveraging a decade of investiments in R&D and research collaborations, Exail offers singlemode and multimode radiation hardened fibers for use in harsh environments with high radiation levels and/or extreme temperatures.

Polyimide offers excellent performance both at cryogenic and high temperatures up to +300 °C. Exail's high quality polyimide coating enables large numbers of femtosecond FBG to be inscribed with high yield directly through the coating for sensing applications.

Benefits & Features

- Singlemode operation at 1550 nm
- Radiation-Hardened for high radiation levels
- Excellent radiation induced attenuation (RIA)
- High-quality polyimide coating
- Operation from cryogenic temperatures to +300 °C
- Matching radiation-tolerant (Ge-doped) fiber

Applications

- Sensing and monitoring in harsh environment
- Femtosecond FBG inscription
- Distributed Temperature Sensing (DTS)

Related Products

- IXF-RAD-SM-1550-014-HT
- IXF-RAD-SM-1550-014-AL
- IXF-SM-1550-125-014-PI

Related Publications

- G. Mélin et al., "Radiation Resistant Single-Mode Fiber With Different Coatings for Sensing in High Dose Environments," in IEEE Transactions on Nuclear Science, vol. 66, no. 7, pp. 1657-1662, July 2019, doi: 10.1109/TNS.2018.2885820
- G. Mélin, A. Barnini, A. Morana, S. Girard, P. Guitton and R. Montron, "Combined effect of radiation and temperature: towards optical fibers suited to distributed sensing in extreme radiation environments," 2019 19th European Conference on Radiation and Its Effects on Components and Systems (RADECS), Montpellier, France, 2019, pp. 1-4, doi: 10.1109/RADECS47380.2019.9745718
- E. Shafir et al., "Performance of an F-Doped Fiber Under Very High Ionizing Radiation Exposures," in IEEE Transactions on Nuclear Science, vol. 69, no. 12, pp. 2290-2296, Dec. 2022, doi: 10.1109/TNS.2022.3224400
- P. F. Kashaykin et al., "Radiation Resistance of Single-Mode Optical Fibers at λ = 1.55 μm Under Irradiation at IVG.1M Nuclear Reactor," in IEEE Transactions on Nuclear Science, vol. 67, no. 10, pp. 2162-2171, Oct. 2020, doi: 10.1109/TNS.2020.3019404
- G. Berkovicet al., "Characterization of radiation hardened fibers in a research grade nuclear reactor", in SPIE 11773, Micro-structured and Specialty Optical Fibres VII, 117730V (18 April 2021); doi: 10.1117/12.2592525

Parameters

Cutoff wavelength (nm)	< 1450
Attenuation @1550nm (dB/km)	< 0.6
Mode field diameter @1550 nm (μm)	9 ± 1
Numerical aperture	0.14 ± 0.01
Core/Clad concentricity (μm)	< 1
Cladding diameter (μm)	125 ± 2
Coating diameter (μm)	155 ± 5
Proof test level (kpsi)	100
Radiation induced attenuation (dB/km) * 1 MGy (γ ray), 1550 nm, 23 °C	< 30

* Typical RIA @1550 nm for 1 MGy (γ ray) ~ 25 dB/km

Design parameters

Core material	Pure silica core
Coating material	Polyimide
Operating temperature range (°C)	-60 to +300
Short term bend radius (mm) **	15
Long term bend radius (mm) ***	30

** Short term : < 1 s (assembly)
*** Long term : 20-40 year lifetime

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