SPECIALTY OPTICAL FIBER

IXF-RAD-SENSE-SM-1550-PI

Radiation Sensing Fiber

Radiation sensing fibers are designed to perform fiber-based dosimetry, taking advantage of the linear and repeatable response of the Radiation Induced Attenuation (RIA) versus dose. The RIA response is independant of the particle type (X-rays, Gamma-rays, neutrons), dose rate and temperature, making these fibers well-suited for Tototal Ionizing Dose (TID) measurements.
Point and distributed dosimetry are possible either by coiling Rad-Sense fiber into a small form factor, or by laying the fiber around.a facility, effectively replacing dozens or hundreds of point sensors with a single fiber and interrogator.

Exail's radiation sensing fibers are commonly used with radiation hardened lead fibers.

Benefits & Features

- 1550 nm operation
- Polyimide coating
- Repeatable sensitivity from batch to batch
- Identical response to X-rays, Gamma-rays, neutrons
- Cabling possible for indoor/outdoor deployment
- Other coatings available upon request
- Compatible with Rad-Hard fibers

Applications

- Point dosimetry
- Distributed Optical Fiber Radiation Sensing (DOFRS)
- TID monitoring in nuclear, fusion & high-energy facilities

Related Products

- IXF-RAD-SENSE-SM-1550
- IXF-RAD-SENSE-HI

Related Publications

- Operating Temperature Range of Phosphorous-Doped Optical Fiber Dosimeters Exploiting Infrared Radiation-Induced Attenuation, doi: 10.1109/TNS.2021.3053164
- Qualification and Calibration of Single-Mode Phosphosilicate Optical Fiber for Dosimetry at CERN, doi: 10.1109/JLT.2019.2915510
- Atmospheric Neutron Monitoring through Optical Fiber-Based Sensing, doi.org/10.3390/s20164510
- Dosimetry Mapping of Mixed-Field Radiation Environment Through Combined Distributed Optical Fiber Sensing and FLUKA Simulation, doi: 10.1109/TNS.2018.2882135
- Infrared radiation Induced attenuation of radiation sensitive optical fibers: influence of temperature and modal propagation, https://doi.org/10.1016/j.yofte.2020.102166
- Low radiation dose calibration and theoretical model of an optical fiber dosimeter for the International Space Station, Appl. Opt. 62, E43-E50 (2023)
- Toward an Embedded and Distributed Optical Fiber-Based Dosimeter for Space Applications, doi: 10.1109/TNS.2022.3226194

Parameters

Cutoff wavelength (nm)	< 1450
Attenuation @1550 nm (dB/km)	< 4
Attenuation @1310 nm (dB/km)	< 2.5
Mode field diameter @1550 nm (µm)	8 ± 1
Numerical aperture	0.17 ± 0.01
Core/Clad concentricity (µm)	< 1
Cladding diameter (µm)	125 ± 1
Coating diameter (µm)	155 ± 5
Proof test level (kpsi)	100

Design parameters

Sensitivity coefficient @1550 nm (dB/km/Gy$_{SiO_2}$) *	4 (typical)
Coating material	Polyimide
Operating temperature range (°C)	-60 to +300

* Calibrated using Co^{60} sources, measured at room temperature

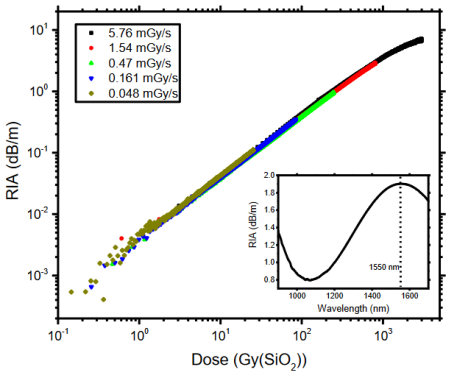

Image from D. D. Francesca et al., "Qualification and Calibration of Single-Mode Phosphosilicate Optical Fiber for Dosimetry at CERN," in Journal of Lightwave Technology, vol. 37, no. 18, pp. 4643-4649, 15 Sept.15, 2019, doi: 10.1109/JLT.2019.2915510

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