

## Rad Hard Active | Fibers

### For space grade fiber amplifiers

The need for new earth and universe observation satellites is becoming more and more important, with new challenges in this very hostile space environment where components are exposed to ionizing radiation. Longer missions, very distant satellite for deep space sensing, and new telecommunication demands necessitate stronger photonic devices and components to withstand ionizing radiation.

iXblue has produced more than 20 flying navigation systems that are equipped with our fibers and components. We have developed a strong experience in the qualification of such devices in collaboration with end users.

### Key Features

- Er doped fiber: gain degradation < 0.25 dB / 100 krad with 30 dB gain EDFA
- Er/Yb doped fiber: gain degradation < 1.5 dB / 100 krad with 10 W amplifier design
- 6 & 12 μm core
- Panda PM and associated passive fibers also available
- High cumulated irradiation dose compatibility

### Applications

- Fiber lasers and amplifiers
- Space grade amplifiers and lasers
- Harsh environment amplifiers and lasers

### Related Products

- Associated passive fiber available
- Er doped fiber
- Er/Yb doped fiber
- Radiation resistant components on passive fibers



## Main Specifications

Er Doped Fiber for EDFA in C&L band, PM or non PM

Product Name	Abs. @980nm (dB/m)	Abs. @1530nm (dB/m)	MFD @1550nm (μm)	Background losses (dB/km)	Cutoff wavelength (nm)	Splice loss (dB)	RIGV (dB/krad)*
IXF-RAD-AMP-1	8 +/- 1	14 +/- 2	5.5 +/- 1	< 15	< 1150	< 0.20 (to smf28)	< 0.07
IXF-RAD-AMP-2	17 +/- 2	25 +/- 3	5.5 +/- 1	< 20	< 1150	< 0.20 (to smf28)	< 0.03
IXF-RAD-AMP-3	13.5 +/- 1.5	16 +/- 2	9.5 +/- 1.5	< 15	< 1150	< 0.20 (to smf28)	< 0.005
<b>Polarization Maintaining Fibers:</b>							
IXF-RAD-AMP-2-PM	15.5 +/- 1.5	25 +/- 3	5.5 +/- 1	< 20	< 1200	< 0.20 (to smf28)	< 0.03

EY Double Clad Fiber for Power Amplifier in C&L band, PM or non PM

Product Name	Core diam. (μm)	Core NA	Core abs. @1536nm (dB/m)	Clad abs. @915nm (dB/m)	Clad abs. @976nm (dB/m)	Cladding diam. Flat/Flat (μm)	RIGV (dB/krad)**
IXF-2CF-EY-O-6-130-LNF-RAD	6 +/- 0.5	0.19	> 30	> 0.6	> 2.0	125 +/- 3	< 0.02
IXF-2CF-EY-O-12-130-RAD	12 +/- 1	0.19	> 30	> 1.8	> 7.2	125 +/- 3	< 0.02
<b>Polarization Maintaining Fibers:</b>							
IXF-2CF-EY-PM-6-130-LNF-RAD	6 +/- 0.5	0.19	> 30	> 0.6	> 2.0	125 +/- 3	< 0.02
IXF-2CF-EY-PM-12-130-RAD	12 +/- 1	0.19	50 +/- 10	> 1.6	> 6.4	125 +/- 3	< 0.02

- PM fiber: round shape & Panda type, birefringence > 1.10<sup>-4</sup>
- Double clad structure with low refractive index coating : NA > 0.46

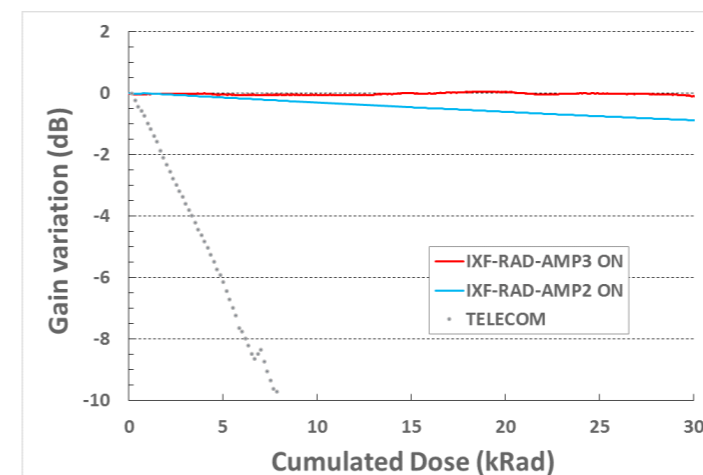
\* RIGV : Radiation Induced Gain Variation for constant forward pumping: 100 mW at 976 nm, Signal: -20 dBm at 1545 nm

\*\* Backward multimode pumping at 915 nm



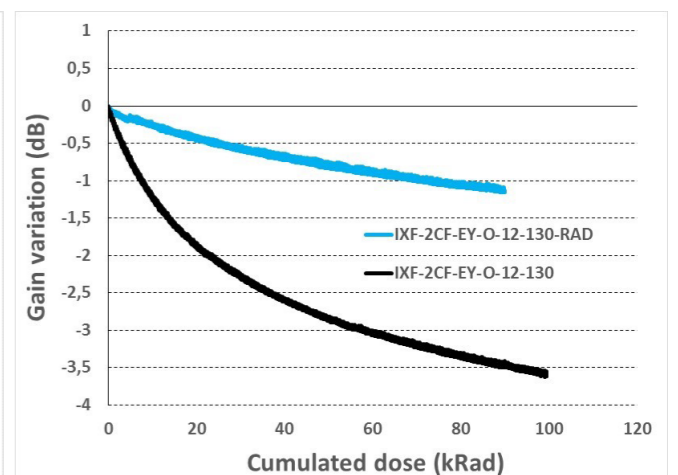
### Single mode Erbium doped fiber

Radiation Induced Attenuation Gain Variation



### Double clad Erbium/Ytterbium doped fiber

Radiation Induced Gain Variation (12 μm core)



- Test configuration: ~1 W output power / ~18 dB Gain, Input wavelength: 1545 nm
- Backward MM pumping ~4 W, Pumping wavelength : 915 nm