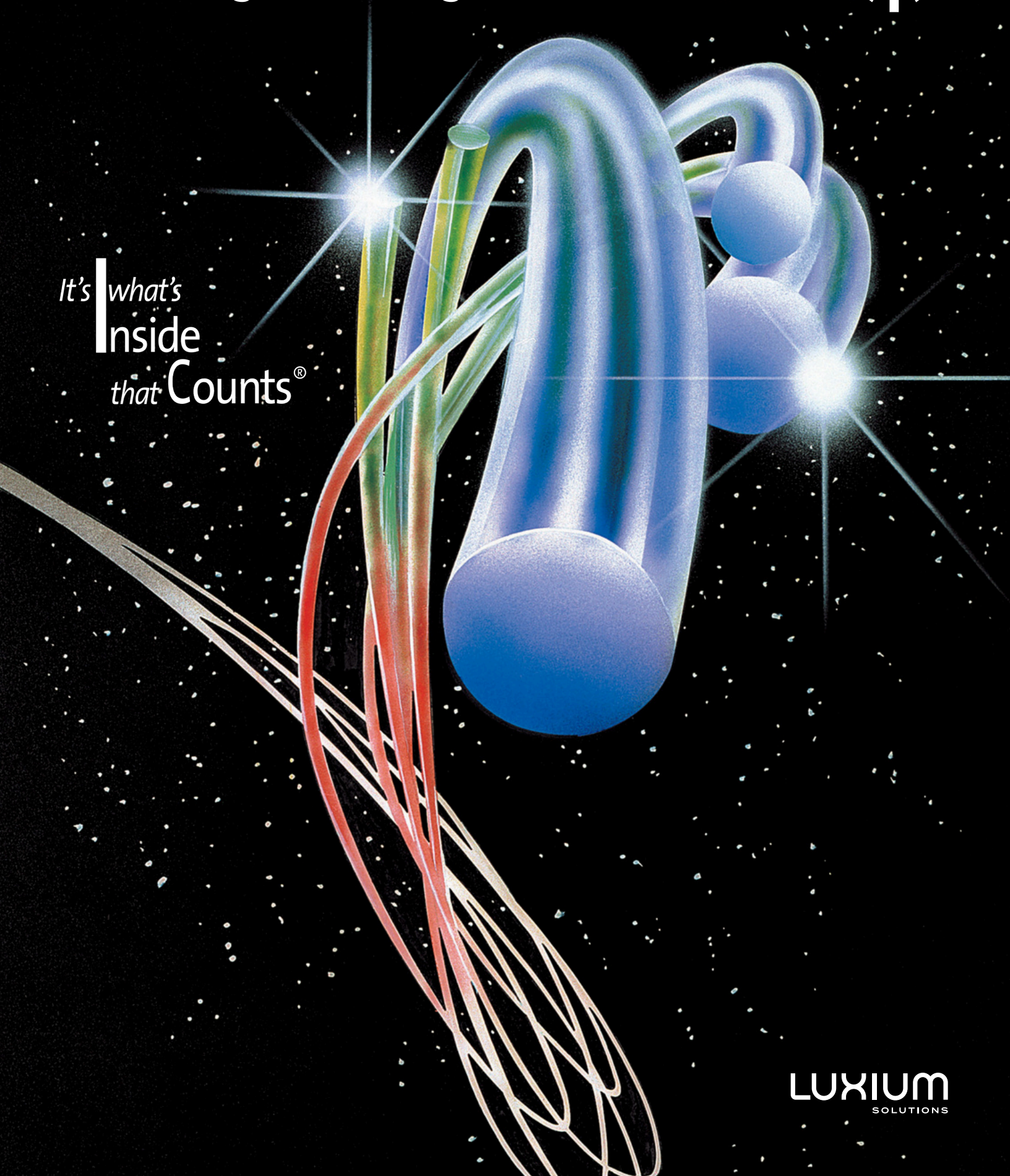


Plastic Scintillating and Wavelength-Shifting Fibers



It's **what's**
Inside
that **Counts**®



LUXIUM
SOLUTIONS

Plastic Scintillating and Wavelength-Shifting Fibers

Luxium Solutions manufactures a variety of plastic scintillating, wavelength-shifting and light-transmitting fibers used for research and industry.

Starting in 2023, Luxium Solutions introduced the BCF-XL series of scintillating and wavelength shifting fibers with improved, market-leading attenuation length for optimal, reliable performance for a variety of different applications.

Scintillating Fibers

Fiber Type	Emission Color	Emission Peak, nm	Decay Time, ns	# of Photons per MeV*	Attenuation Length (m)**	Characteristics/Applications
BCF-10XL	blue	432	2.7	~8000	>4	General-purpose; optimized for diameters >250µm
BCF-12XL	blue	435	3.2	~8000	>4	Improved transmission for use in long lengths
BCF-9998XL	blue	435	3.2	~8000	>4	Scintillating fiber, optimized for maximum light output in short length canes (<0.5m)
BCF-20XL	green	492	2.7	~8000	>4	Fast green scintillator
BCF-60XL	green	530	7	~7100	>4	3HF formulation for radiation hardness

Wavelength-Shifting Fibers

Fiber Type	Emission Color	Emission Peak, nm	Decay Time, ns	# of Photons per MeV*	Attenuation Length (m)**	Characteristics/Applications
BCF-91AXL	green	494	12	n/a	>4	Shifts blue to green
BCF-92XL	green	492	2.7	n/a	>4	Fast blue to green shifter
BCF-9929AXL	green	492	2.7	n/a	>4	Blue to green shifter. Pairs well when exciting wavelengths are >425nm (e.g. injection-molded and extruded scintillators)
BCF-9995XL	blue	450	2.7	n/a	>4	UV to blue shifter
BCF-9906AXL	orange	540	21.6	n/a	-	Green to orange shifter
BCF-99172XL	red	605	22.6	n/a	-	Green to red shifter

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Optical Fibers

Fiber Type	Emission Color	Emission Peak, nm	Decay Time, ns	# of Photons per MeV*	Attenuation Length (m)**	Characteristics/Applications
BCF-98XL	n/a	n/a	n/a	n/a	Not available	Clear waveguide

*For Minimum Ionizing Particle (MIP), corrected for PMT sensitivity

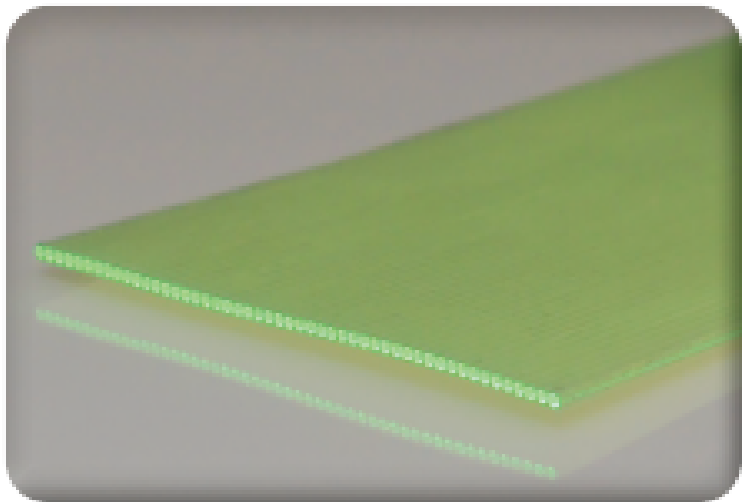
** For 1mm diameter fiber, measured using silicon photodiode

Our fibers are available in bulk quantities wound on spools (we do not recommend spooling fiber diameters >2mm as they tend to exhibit “strain hysteresis”) and as canes (pre-cut straight lengths). They can be assembled into stacked arrays, bundles, ribbons and complete detectors. Current sizes range from 0.5 mm to 3 mm in round cross-sections. Custom sizes and designs available upon request.

Fiber Ribbon Design Parameters

For Scintillating, wavelength-shifting, and light-transmitting single fiber ribbons:

- Minimum fiber diameter: 0.5mm Standard Ribbon Length: 2" (50mm) minimum / 130" (3300mm) maximum
- Contact us for requests outside our standard length dimensions
- Width: 20" (508mm) maximum Ribbon end finish options:
 - Rough-Cut Finish: +/- 12.7mm (+/- 0.5")
 - Diamond-Mill Finish
 - <2m length: +/- 0.25mm (+/- 0.010")
 - >2m length: +/- 1mm (+/- 0.0394")



Luxium Solutions manufactures a variety of plastic scintillating, wavelength-shifting and light-transmitting fibers used for research and industry. The flexibility of fibers allows them to conform to surface shapes, yielding geometries superior to those of other types of detectors.

These fibers are well-suited for such applications as:

- Neutron imaging
- Particle discrimination
- Calorimeters
- Cosmic ray telescopes
- Real-time imaging systems
- Flow cells
- Tracking detectors
- Nuclear gauging
- Pipe/Barrel monitoring

Single-Clad Fibers

Our standard fibers consist of a polystyrene-based core and a PMMA cladding. The scintillating core contains a combination of fluorescent dopants selected to produce the desired scintillation, optical and radiation-resistance characteristics. Often, one property is enhanced while another is mildly compromised. In small fibers (< 0.5mm), the fluor concentration may be increased on request, usually at the expense of light attenuation length. These fibers yield about 8,000 photons per MeV deposited.

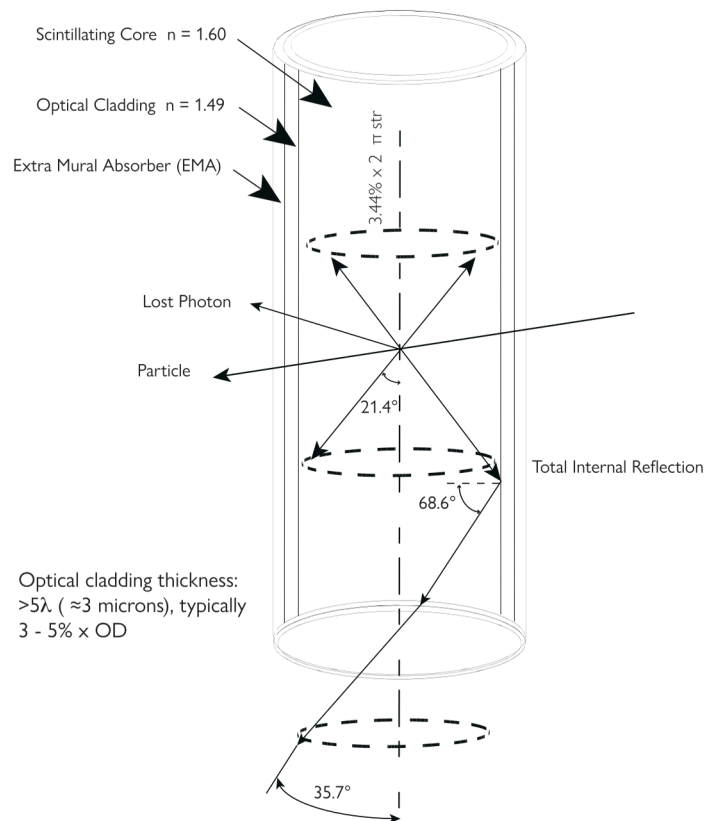
Optical Cladding

PMMA (polymethylmethacrylate, $\text{C}_5\text{H}_8\text{O}_2$) is the standard cladding material for Luxium Solutions' fibers. It has a density of 1.2 g/cc and a refractive index of 1.49. The refractive indices of the core and cladding and the cross sectional shape of the fiber determine the trapping efficiency. In round fibers, the trapping efficiency also depends on the distance between the fiber axis and the scintillation event. The trapping efficiency of Luxium Solutions' round fibers ranges from 3.4% for events occurring at the fiber axis to approximately 7% for events near the core-cladding interface.

Common properties of Single-Clad Fibers

Core material	Polystyrene
Core refractive index	1.60
Density	1.05
Cladding material	Acrylic
Cladding refractive index	1.49
Cladding thickness, round fibers	3% of fiber diameter
Diameter Tolerance	<2% for fiber length up to 2 meters
Numerical aperture	0.58
Trapping efficiency, round fibers	3.44% minimum
No. of H atoms per cc (core)	4.82×10^{22}
No. of C atoms per cc (core)	4.85×10^{22}
No. of electrons per cc (core)	3.4×10^{23}
Radiation length	42 cm
Operating temperature	-20 C to +50 C
Vacuum compatible	Yes

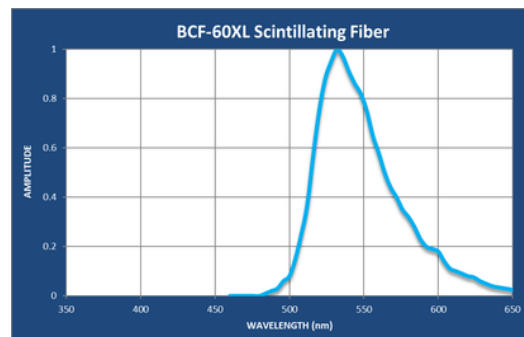
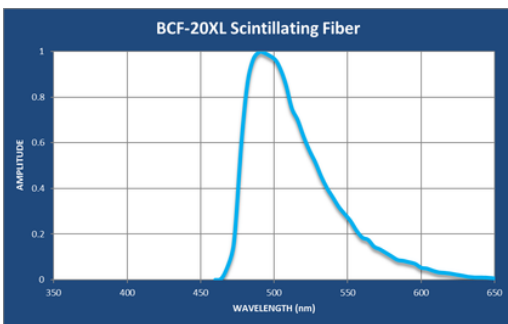
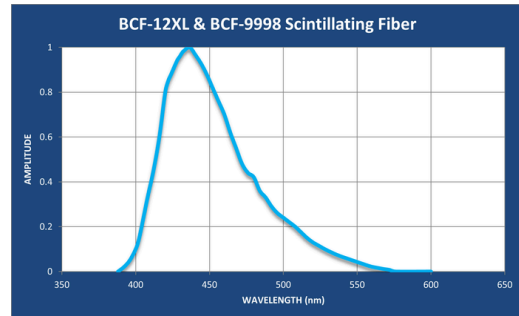
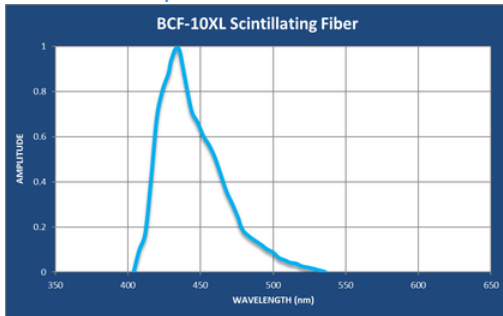
A Typical Round Scintillating Fiber



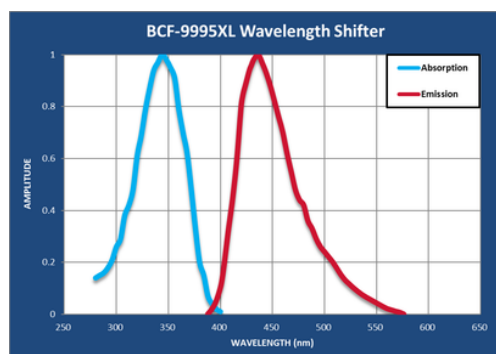
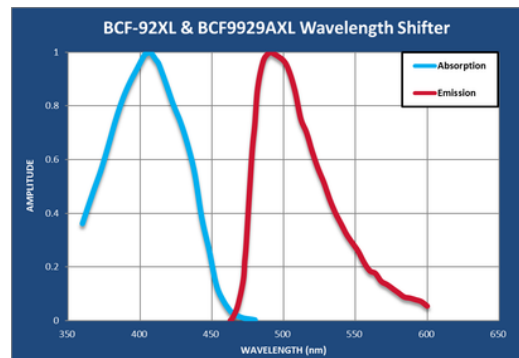
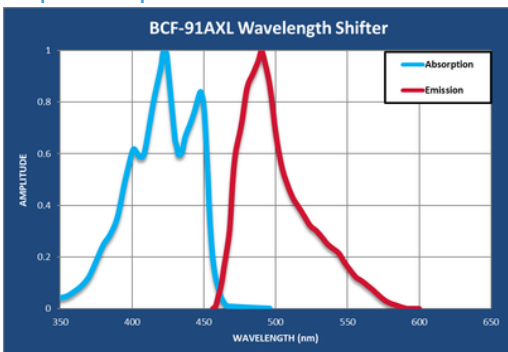
Types of Fiber Assemblies Available –

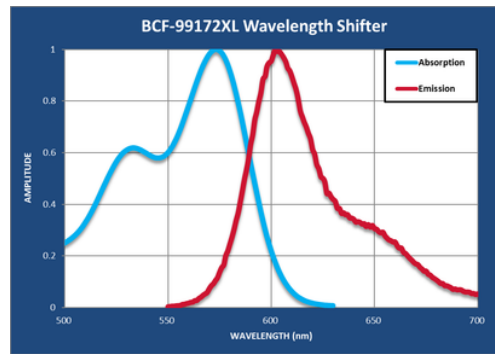
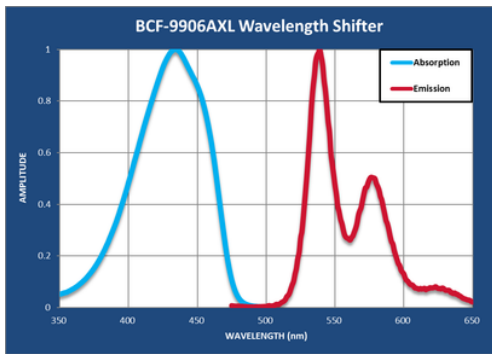
- Single ribbons as wide as 508mm and as long as 5500mm
- Multi-layered ribbons up to 4 layers thick
- Coherent imagers of round fiber
- Ribbons with precision alignment to MA-PMTs (What are MA-PMTs?)
- Crossed fiber arrays
- Flow cells
- Detectors with long, flexible sheathed bundles

Emission Spectra -



Optical Spectra -





For additional product literature or information, call customer service at any of our locations or access our website document library - www.luxiumsolutions.com.

Other radiation detection products available from Luxium Solutions include:

- Plastic scintillators available as rods, blocks, ingots, thick and thin sheets, tubing and spheres.
- Scintillating optical fibers which can be assembled into ribbons, arrays or complete detectors.
- Liquid scintillators as detectors or as bulk material.



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www.luxiumsolutions.com

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