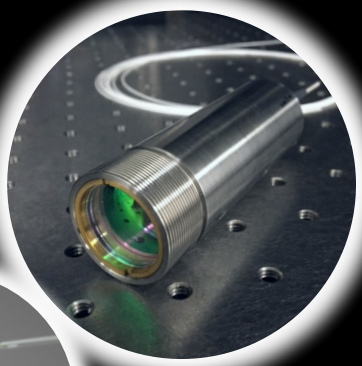
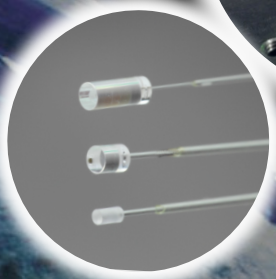
OPTICS OPTIMIZED FOR SPACE

By LightPath Technologies



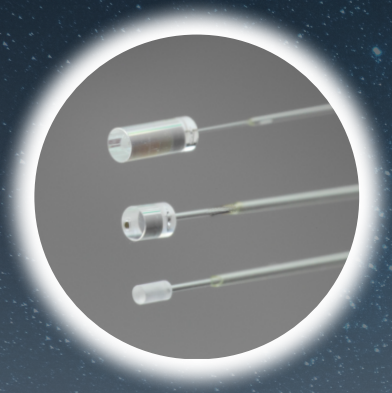


LightPath works with 40+ private and government entities in the space and aerospace industry, leveraging the location of our corporate facility conveniently situated in Orlando, Florida alongside the Space Coast. With over 35 years of expertise, our optics and photonics components enable mission success for geostationary, medium-earth orbit (MEO) and low-earth orbit (LEO) space satellites. At LightPath, we can identify and design your critical optical system requirements, then deploy next-generation solutions to ensure the most optimized solution possible.

LightPath® TECHNOLOGIES

Fusion™ Fiber Collimators

LightPath Fusion™ Collimators and fiber optic assemblies utilize proprietary fiber fusion technology that allows collimators to be used at higher powers for pairing, targeting, or pigtailing applications. The lens is laser fused directly to the optical fiber, eliminating any interface causing unwanted signal distortion, photo & conformance degradation with temperature and service life. Recognized by commercial and scientific industry leaders for offering unmatched stability versus other technologies in various environmental conditions, as well as perfectly suited for extremely small packages.



LightPath Fusion™ Advantages:

- Laser Fusion™ of fiber optics with cladding up to 550µm in diameter
- Can handle up to 100W optical power
- Eliminates surface effects and damages caused by 405nm laser irradiation
- Micro-optic lenses from 0.7mm diameter and up
- Huge selection of diverse and specialized optical fibers
- Standard to Customized AR coatings
- The assemblies can be customized with a variety of cable & connector types
- From C-lens to a full portfolio of Precision Molded Aspheric and Specialty glasses (Polished Silica Aspheric, Rad-Hard glasses recommended for High Power laser systems and Harsh environments are available upon request)

Technical Data

Wavelengths	400nm to 1550nm
Fiber Types*	Single Mode | Multimode | Polarization Maintain | LMA
Fiber	Acrylate coating | Polyimide coating
Cable Diameters*	250µm; 900µm; 3mm
Cable Types	Buffer Coating | Hytrel | PTFE | PVC+ Kevlar | Armour
Connector	FC/APC; FC/PC; SC/PC; Pigtail
Beam Diameters	0.2 to 12.5mm (Single-Mode)
Polarization Ratio	>100:1 (Pigtails)
Connector Key Element	Slow and Fast Axis
Coupling Efficiency	>70%
Pointing Accuracy	<1.0° Standard | <0.5° Premium (Based on Design)
Power Handling	>10W Small Beams & Large Beams | 100W Premium Designs
Return Loss	≤60dB (Typical)
Anti-Reflective Coatings*	400 to 1550; Reflective ⩽ 0.5% (See standard options)
Storage Temperature	-40 to +85°C

*custom available upon request

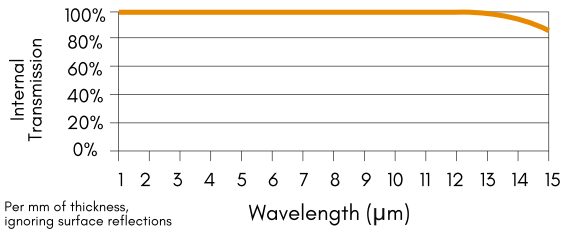
Chalcogenide BD6™ Material

Our high-quality BD6™ Chalcogenide glass is an ideal alternative to Germanium in high-performance applications. These infrared lenses enable optical athermalization (-40C to +80C) and high transmission while retaining low weight and cost. Engineered to utilize aspheric surfaces with diffractive dispersion correction, our BD6™ lenses can be manufactured with a focal length of 1.5mm - 50mm. Utilizing our Precision Glass Molded (PGM) Technology, we can scale to high-volume requests while maintaining tight tolerances. These lenses can be upgraded with high-efficiency AR coatings for full LWIR band (8-14 µm), with optional DLC for added protection.

Advantages of LightPath's BD6™ Glass:

- High Transmission over 1-14µm Band
- Low Weight (13% lower than Ge)
- Optical Athermalization with low dn/dT (13 times lower than Ge)
- Can be diamond-turned, polished or molded (scales to high volume)
- No Germanium Content

Internal Spectral Transmission[1]



[1] Per mm of thickness, ignoring surface reflections

Internal Transmission Formula

$$T_i = e^{(-\alpha d)}$$

Where α is the absorption coefficient, and d is the sample thickness

Coatings
HEAR and DLC coatings available

Optical Properties		
Wavelength λ (µm)	Refractive Index	Absorption Coefficient (cm^{-1})
2	2.8230	0.003
4	2.7978	0.002
6	2.7914	0.002
8	2.7867	0.002
10	2.7816	0.003
12	2.7755	0.004
14	2.7683	0.0068

Mechanical Properties	
Density	4.63 g/cm³
Hardness (Vickers)	142 HV
Young's Modulus	19.8 GPa

Thermal Properties	
Max Exposure Temp	110°C
CTE (25-100°C)	22.5 x 10-6/°C
dn/dT @ 10 µm (0-40°C)	30.5 x 10-6/°C

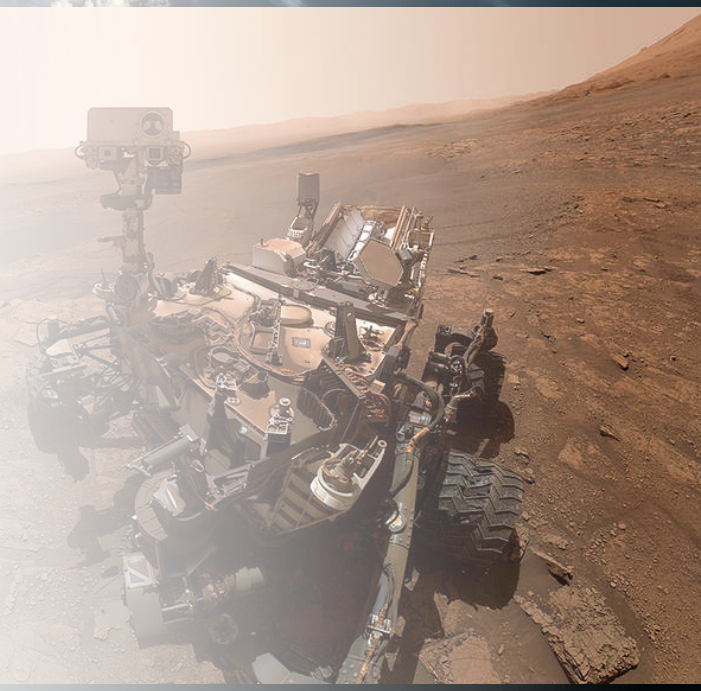
Equivalent Glass Type	
Brand	Name
Schott	IRG 26
Vitron	IG6

Next-Gen Solutions for Space Applications

Explore our out-of-this-world precision custom optics solutions supporting missions aboard the ISS, Space Shuttle, Mars Curiosity Rover and integrated into numerous satellites & telescopes. We are continuously accelerating the expansion of our capabilities to match the rapid pace and rigorous demands of space exploration.

With the exponential growth in the launch of space payloads and thousands of orbiting nano satellites, LightPath is seeing growth in demand for optics to be used in such space applications, for imaging, analysis and optical communication between satellites.

In partnership with Israel's Innovation Authority (OCS) Ministry of Science, LightPath has recently been granted funds from Space Florida to qualify for more optical materials for use in Outer Space. With these resources enabling us to optimize our optical components, sub-assemblies and proprietary BD6 infrared material, we'll continue to provide the space industry with qualified and groundbreaking optics from beyond earth.



Other Optics & Photonics Solutions:

- *Precision Molded Aspheric & Freeform Lenses*
- *Optical and Opto-Mechanical Design*
- *BD6 Chalcogenide Glass Lenses*
- *IR Crystalline Materials*
- *Diamond Turning & CNC Polishing*
- *AR/HEAR/DLC and Specialty Coatings*
- *MWIR/LWIR Thermal Imaging Assemblies*

Let us help you launch your next mission.
Contact sales@lightpath.com to get started.