IRflex

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FUSED FIBER COMBINER

Chalcogenide MWIR Fused Fiber Combiner (1.5 to 6.5µm)

Beam combining devices are extensively used to achieve power levels that can not be reached by the use of just a single laser. To achieve beam combination, these devices commonly employ free-space optics like mirrors, gratings and lenses, which has issues such as thermal sensitive, vibration induced misalignment, complex packaging and bulky design. Fiber beam combiners take multiple fibers and fused them together to form a monolithic common output aperture, thereby combining their output powers and wavelengths, with the additional benefit of being compact and robust, permitting simple packaging and meeting stringent environmental requirements.

Inspired by the silica fiber combiners, IRflex's proprietary manufacturing technology of chalcogenide glass Mid-IR fibers makes it possible to extend the power combining capacity beyond 2µm silica fiber wavelength range.

Chalcogenide fiber offers a good building block for such devices with low-loss transmission of 0.1dB/m in the MWIR (1.5 to 6.5µm) and excellent power handling.

Using IRflex's arsenic sulfide glass fibers, IRflex's multimode Mid-IR fused fiber combiners can incoherently combine the power from multiple laser sources into a common output aperture. These combiners can also spectrally combine laser sources that cover the MWIR spectrum from 1.5 to 6.5µm.

Applications

- Power and wavelength combining of IR diodes and Quantum cascade lasers for high power laser systems
- Remote sensing
- Long-range target identification
- LIDAR
- Gaseous leaking detection
- Mineral and petroleum prospecting
- Medical surgery

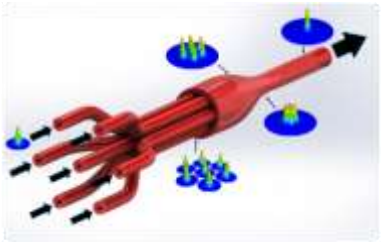
Key Features

- High port transmission and combining efficiency for MWIR spectral beam combining up to 95%
- Independent wavelength transmission from 1.5 to 6.5µm
- High power handling strength with mechanical flexibility
- Custom configurations availability

IRflex Corporation is the only U.S. company totally dedicated to the development and manufacture of mid-infrared fibers and devices for wavelengths from 1.5 to 11 micron.

IRflex has several patents on specialty chalcogenide optical fibers and expertise in these fibers' design and development. These strong patent portfolios and intellectual know-how, coupled with advanced manufacturing processes, are the core competencies which enable IRflex to sustain its leadership in the mid-infrared industry and provide cutting-edge products for mid-infrared applications.

Fused Fiber Combiner Concept



Technical Specifications

Models	Ports	Operation Wavelength	Input Fiber	Output Aperture	Port Transmission Efficiency
MWIR-FC-3	3-to-1	1.5 to 6.5μm	100μm core diameter NA=0.30	100μm diameter NA=0.30	75 to 98%*
MWIR-FC-7	7-to-1	1.5 to 6.5μm	50μm core diameter NA=0.20	100μm diameter NA=0.20	75 to 98%*

** Customers outside of the United States: please note our current export permit limited the combined input power under 5 Watts (CW)*

The input fiber connector types include FC/APC, FC/UPC, SMA or IRflex's FC/B® - the FC connector at Brewster Angle that enables perfect coupling without reflection with polarized laser beam. The standard output fiber connector is SMA connector.

Due to chalcogenide glass' high refractive index (n=2.4), approximately 17% of the light will be reflected at each interface, which results in a total transmission of 69% of the incident light. To meet optimum transmission requirements, the fiber end faces may need to have AR coatings to increase the throughput of the system and reduce hazards caused by reflections traveling backwards through the system (ghost images). AR coating is also very durable, with resistance to both physical and environmental damage.

IRflex uses industrial experts to offer anti-reflection coating, broadband or at a specific wavelength, on any flat input and output fiber connectors of the MWIR Fused Fiber Combiner as an option.

The combiner with AR coating can only use stainless steel jacket as the AR coating procedure can vapor PVC sheathing.

When specifying an AR coating to suit your specific application, please be fully aware of the full spectral range of your system. While an AR coating can significantly improve the performance of an optical system, using the coating at wavelengths outside the designed wavelength range could potentially decrease the performance of the system. In applications where high optical power is a requirement, such as laser optics or high-intensity lighting systems, the AR coatings may impose limitations on the maximum power that can be safely handled without compromising performance or risking damage to the optical components.

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