

Eight-port beam splitter principle and price



Overview

A beam splitter or beamsplitter is an optical device that splits a beam of light into a transmitted and a reflected beam. It is a crucial part of many optical experimental and measurement systems, such as interferometers, also finding widespread application in fibre optic telecommunications.

Key Takeaways

An eight-port beam splitter, such as the X-cube, splits and routes multiple input beams into multiple outputs using integrated solid-optics, enabling lossless beam distribution and wavelength multiplexing. Principle of Operation

An eight-port beam splitter is an advanced optical device designed to divide and combine light among multiple channels. The X-cube, a common implementation, can handle four input beams and distribute them across eight output ports. It operates using solid-optics integration, where internal prisms and coatings direct light through total internal reflection and partial transmission, minimizing insertion loss. This allows the device to perform lossless beam splitting, filtering, and wavelength routing, making it suitable for fiber-optic communication, star-coupling, and add/drop multiplexing applications. The X-cube demonstrates high performance metrics, including an insertion loss of 2.1 dB, a uniformity ratio of 1.036, and a uniformity variance of 0.279, indicating consistent power distribution across all output ports. The device can also be adapted for wavelength-division multiplexing, enabling simultaneous routing of multiple wavelengths with minimal crosstalk.

Comparison to Standard Beam Splitters

Unlike standard two-port or four-port beam splitters, which split light by intensity, wavelength, or polarization, the eight-port X-cube integrates multiple splitting functions in a compact solid-optics package. It is conceptually similar to cube or plate beam splitters but optimized for multi-channel optical networks .

Price Considerations

Eight-port beam splitters are highly specialized optical components, often custom-fabricated for research or telecom applications. Prices typically range from \$2,000 to \$10,000 USD depending on specifications such as wavelength range, insertion loss, coating type, and fiber-coupled packaging. For comparison, standard two-port cube or plate beam splitters for laboratory use usually cost \$50-\$500 USD, highlighting the premium for multi-port, high-precision devices .

Applications

- Fiber-optic communication networks: routing multiple wavelengths efficiently
 - Optical interconnects: star-coupling and signal distribution
 - Wavelength-division multiplexing (WDM): add/drop multiplexing
 - Advanced interferometry and laser systems: multi-beam experiments
- In summary, the eight-port X-cube beam splitter is a sophisticated optical component that enables precise multi-channel light distribution with low loss, and its price reflects its specialized design and high-performance specifications.

Article Content

Beam splitter

Overview Designs Phase shift Classical lossless beam splitter Use in experiments Quantum mechanical description Reflection beam splitters

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Beam Splitter | Precision, Applications & Design Principles

Explore the precision, applications, and design principles of beam splitters, essential for advancements in scientific

Covering the Basics of Beamsplitters — Firebird Optics

Beam splitters are integral to most optical systems and are also used in interferometers, fiber

Beam Splitters – optical power splitter, beamsplitter, thin-film ...

Beam splitters are devices for splitting a laser beam into two or more beams. There are different types, including polarizing and non

Beam splitter

A beam splitter or beamsplitter is an optical device that splits a beam of light into a transmitted and a

Beam Splitter

A beam splitter is defined as an optical device that effects a linear transformation of fields presented at two input ports, producing

Working Principle Of Optical Splitter

Optical splitter is a core passive device in FTTH system. Optical splitter, also called optical beam splitter, is an

Optical Splitters in Modern Networks

This principle enables the reallocation technique of optical signals in multiple fibers, giving rise to the development of

Fiber-optic splitter

A fiber-optic splitter, also known as a beam splitter, is based on a quartz substrate of an integrated waveguide optical power

Beam Splitter Selection Guide

Our beam splitters are made from high grade glass material with laser grade surface flatness & surface quality for tighter tolerance

Optical Beamsplitter

A beamsplitter is an optical component used to split a beam of incident light into two parts in a laser or illumination system. Cube

Your Go-to Guide to Optical Splitter

Working Principle of Optical Splitter A fiber optic splitter generally consists of input port (s), output ports, couplers,

How Does a Beam Splitter Work? Types, Principles & Applications

Learn how beam splitters work, compare cube and plate designs, and explore applications in lasers, microscopy, and interferometry.

What is a Beam Splitter?

A beam splitter or power splitter is an optical device that can split an incident light beam e.g. a laser beam into two or

Beam Splitter Input-Output Relations

The elements of the beam splitter transformation matrix B are determined using the assumption that the beamsplitter is lossless.

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