

Article Overview

A beam splitter is an optical device that divides an incoming light beam into two or more separate beams, with controlled reflection and transmission ratios, used in a wide range of optical systems.

Function and Principle

A beam splitter splits an incident light beam into transmitted and reflected components, or conversely, can combine beams into one. The division is controlled by a partially reflective coating or material properties, and the device maintains a defined amplitude and phase relationship between the output beams. It is a passive optical element, meaning it does not amplify light and may introduce minor losses due to absorption or scattering .

Types of Beam Splitters

- o Cube Beam Splitters: Constructed from two right-angle prisms cemented together, often with a coated hypotenuse. They provide mechanical stability and minimize lateral beam displacement .
- o Plate Beam Splitters: Thin glass or plastic plates with a reflective coating on one surface. They are simpler and lighter but can cause slight beam displacement and are typically used at a 45° angle of incidence .
- o Pellicle Beam Splitters: Extremely thin membranes that virtually eliminate ghost reflections and lateral displacement, ideal for low-power or high-precision applications like interferometry .
- o Polarizing Beam Splitters: Use birefringent materials to separate light into orthogonal polarization states, useful for polarization-sensitive applications .

Key Characteristics

- o Splitting Ratio: Defines the proportion of light reflected versus transmitted (e.g., 50/50, 70/30). Some designs allow variable ratios using rotatable coatings or waveplates .
- o Polarization Dependence: Some splitters are non-polarizing, while others separate S- and P-polarized light.
- o Wavelength and Angle Sensitivity: Performance can vary with the light's wavelength and angle of incidence, requiring careful selection for broadband or narrowband applications .

Applications

- o Interferometry: Core component in Michelson interferometers and gravitational wave detectors like LIGO, where precise splitting affects interference patterns and noise reduction .
- o Optical Instruments: Cameras, microscopes, and projectors use beam splitters to direct light to multiple sensors or optical paths .
- o Telecommunications: Fiber-optic networks employ splitters to distribute signals efficiently across multiple

Characteristics of beam splitters

channels .

o Quantum Optics and Holography: Used to manipulate single photons, create entanglement, or divide laser beams into object and reference paths for holographic imaging .

Summary

Beam splitters are versatile optical components essential for dividing or combining light in controlled ways. Their design--cube, plate, pellicle, or polarizing--affects performance, stability, and suitability for specific applications, from laboratory experiments to telecommunications and quantum technologies . Proper selection ensures accurate light distribution, minimal loss, and optimal system performance.

Thorlabs offers a wide range of optical beamsplitters. Our plate beamsplitters have a coated front surface that determines the beam

Nonpolarizing plate beamsplitters Nonpolarizing plate beamsplitters have been designed for use in situations in which the

Beam splitter technologies can be categorized according to their construction and optical behavior, including cube beamsplitters,

The scattering characteristics of subwavelength gratings provide more flexible design degrees of freedom for the

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

A lossless beam-splitter has certain (complex-valued) probability amplitudes for sending an incoming photon in to one

Explore different types of beam splitters and their applications. Learn how beam splitters work and find the right one for your needs.

Explore the types, workings, and uses of beam splitters in high-tech devices.

Selecting the Right Beamsplitter Beamsplitters are optical components that split light into two directions,

Quick-reference guide for beam splitters -- key equations, type comparison tables, Fresnel reflectance, polarizing designs, and a

Characteristics of beam splitters

Beam splitters can be of different types; each beam splitter type has unique characteristics and creates a unique output. Here, we

Matching the beam splitter's specifications to the characteristics of the light source ensures optimal performance. This

Understanding Beam Splitters Beam splitters are essential optical components used to divide a beam of light into two

s) then serve to specify the splitter's operational characteristics. In practice, beamsplitters are often constructed in the

Polarizing beam splitters can be made using various materials, including glass, crystals, and polymers. They are often

A beam splitter is an optical element that splits incident light into two beams of the same wavelength or two beams of different

Web: <https://bssoda.pl>

