

Positive and Negative Beams from the Secondary Beam Splitter

Article Overview

In a secondary beam splitter, the incident light or photon beam is divided into two output beams with specific phase relationships, often referred to as positive and negative beams, depending on constructive or destructive interference.

Beam Splitting Basics

A beam splitter is an optical device that divides an incoming light beam into two separate beams: one transmitted and one reflected. The splitting ratio can be 50/50 or customized, and the output beams may have different phase shifts depending on the type of splitter and polarization of the light. Polarizing beam splitters separate light based on polarization, while non-polarizing splitters maintain the polarization state.

Secondary Beam Splitter Behavior

When a beam that has already been split by a primary splitter enters a secondary beam splitter, the output beams are determined by the transmission (T) and reflection (R) coefficients of the splitter. For a 50/50 splitter, the amplitudes of the output fields are typically scaled by $1/2$ and may acquire a relative phase of $\pi/2$ or π depending on the reflection path. These outputs are often labeled as positive and negative beams:

- Positive beam: The output that constructively interferes with the original phase of the input, often corresponding to the transmitted component.
- Negative beam: The output that is phase-shifted relative to the input, often corresponding to the reflected component, which can interfere destructively with other beams in the system.

Quantum and Interferometric Context

In quantum optics, the field operators for the two input ports of a beam splitter evolve as:

$$E_1 \rightarrow TE_3 + RE_4, E_2 \rightarrow RE_3 + TE_4$$

where E_1 and E_2 are the input fields, E_3 and E_4 are the output fields, and T and R are the complex transmission and reflection coefficients. After a secondary splitter, the outputs can interfere depending on the relative path lengths and phases, producing...

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Optical Beamsplitters Explained | Cube & Polarizing Types

A beam splitter, or beamsplitter, is an optical component used to divide incident light into two separate beams based on wavelength,

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How can you split a laser beam?

At Gentec-EO, we designed beam samplers for high-power laser beams, based on the plate beam splitter principle. Using two

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Beam Splitter

A conventional beam splitter is an optical component used to divide an incident beam into two or more beams by refracting or

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Beam Splitters: Types and Applications

Beam splitters find their application in a diverse array of fields, from teleprompters to robotics, impacting various technologies we rely

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Transmission and Reflection by Beamsplitters

In addition to the task of dividing light, beamsplitters can be employed to recombine two separate light beams or images into a single

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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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(PDF) Quantum physics and the beam splitter mystery

Non-polarizing beam-splitters (BSs) are the heart of most optical experiments and instruments (optical coherence

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The Theory of the optical wedge beam splitter

If a pencil beam of radiation is incident upon it, a portion enters the material and undergoes a series of reflections at the surfaces. At

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Beam splitters

A beam splitter works like a mirror that transmits part of the light. So there is always part of light that goes directly through without

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Beam Splitter and Nonclassical Light

A beam splitter is an optical component which is partially transparent. An incident beam on a beam splitter is partially reflected and

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Understanding Beamsplitters: A Comprehensive Guide

They are ideal for laser beam steering applications, where polarization control is critical. These beamsplitters can be manufactured in

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Beam Splitters - optical power splitter, beamsplitter, thin

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

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Beam Splitter and Nonclassical Light

An incident beam on a beam splitter is partially reflected and partially transmitted, and thus split into two beams. Classically, an

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Optical Beam Splitter Guide: Cube, Plate & Polarizing Types

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

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How does a beam splitter work? Common types and use cases

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

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How to model a beam splitter in Sequential Mode – Ansys Optics

This article explains how to create a beam splitter cube in Sequential Mode. One of the biggest challenges for modeling such a

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Diffractive beam splitter

A diffractive beam splitter can generate either a 1-dimensional beam array (1xN) or a 2-dimensional beam matrix (MxN), depending

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Beam Splitter

The beam-splitter directs a second beam of light to the sample where it is reflected. The two beams of light return to the beam-splitter

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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.

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Fundamental properties of beam-splitters in classical and quantum optics

In practice, beam-splitters are often constructed in in complete accord with the standard quantum-optical treatment of beam-splitters

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How Beamsplitters Work: Types, Mechanisms, and Applications

This article explains the working principles of beamsplitters, detailing how they divide a beam of light into two separate

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Selecting the Right Beamsplitter

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

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All You Need to Know About Beam Splitters

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

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Beamsplitters Product Overview

The curvature (convex, concave) and the unevenness of the beam splitter primarily have a negative effect

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What are Beamsplitters?

Beamsplitters are optical components used to split incident light at a designated ratio into two separate beams. Additionally,

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Quantum physics and the beam splitter mystery

An illustrative experiment described by Grangier, Roger and Aspect (GRA), being built around a single beam splitter (BS) revealing

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Introduction To Splitters | Teledyne Vision Solutions

Introduction To Splitters Introduction Early microscopes were essentially a tube through which light travels

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Notes on the Dual Beam Splitter Experiment

First, let's suppose that the second beam splitter were not present in the apparatus. Then the photon follows one of two paths

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