

Fiber Collimator Coupling Simulation



Overview

As high coupling efficiency and return loss are crucial in fiber-optic transmission systems, they have attracted widespread attention. This study proposes a ray-transfer matrix-based mathematical analysis method and experiment. As high coupling efficiency and return loss are crucial in fiber-optic transmission systems, they have attracted widespread attention. This study proposes a ray-transfer matrix-based mathematical analysis method and experimentally demonstrates a collimator based on a gradient-index lens with an angle polish. The propagation characteristics and coupling mechanisms of the collimators are introduced. A beam-steering technology based on a wedge prism and flat glass is proposed to improve the coupling efficiency of the Gaussian beam using collimators. The proposed method is validated via simulation and experiment. The results are significant in free-space optical communication, optical signal processing, and optical fiber connectors.

- Proposed a new analytical method for determining the length of collimators based on a Gradient-index lens with an angle polish.
- Beam-steering technology make the system less sensitive to misalignment and fabrication tolerance.
- Among the three deviations of the coupling mismatch, the angular deviation has the greatest influence.

Coupling efficiencyReturn lossGradient-index lensBeam-steering technologyOptical fibers are considered an emerging technology in the industry, medical surgery, and military fields as they offer wider bandwidth, large capacity, simple structure, and good confidentiality, and do not require a spectrum license,,,. Fiber coupling efficiency (FCE) and return loss (RL) are the key factors in fiber-optic sensing, optical coherence tomography, space laser communication, and fiber-to-chip couplers. As the core diameter of the common single-mode fiber (SMF) is small, it is difficult to achieve direct alignment of the two fibers in free space. Generally, a Gaussian beam is expanded and collimated by optical fiber collimators to achieve high coupling efficiency. Optical fiber collimators...

Article Content

Spatial coupling efficiency of collimators based on gradient-index lens ...

To analyze the effect of alignment errors on the coupling efficiency, the coupling of the collimators based on the GRIN lens was simulated using the ray-tracing method, as shown in Fig. 9.

Optimizing Fiber Optic Coupling Efficiency with TracePro Simulations

Maximizing fiber optic coupling efficiency is essential for enhancing optical system performance. With TracePro, engineers gain a powerful tool for simulating and optimizing fiber optic ...

Optical Coupling Efficiency of a Coupler with Double-Combined ...

In the present study, a symmetrical fiber coupler with DCLs and TECF was designed. The optical coupling performance of the coupler was analyzed by investigating the structural characteristics of ...

Single-mode fiber coupling in OpticStudio – Ansys Optics

Accurate analysis of coupling efficiency is critical in the design of fiber coupling systems. This article demonstrates the use of several fiber coupling efficiency analyses in OpticStudio.

Collimation / Coupling

Thorlabs also offers a range of fixed and adjustable collimation packages for collimating a laser beam from the end of an FC/PC, FC/APC, or SMA connectorized fiber while maintaining diffraction-limited ...

Computing Fiber Coupling

The physical optics propagation algorithm may be used to compute fiber coupling efficiency. A ray based method is also supported, for details search the help files for "Fiber Coupling Efficiency".

Integrated microlens and grating coupler for photonic integrated ...

In this article, a multi-scale simulation workflow is introduced for the design of a fiber-to-waveguide coupling system for photonics...

Optical Coupling Efficiency of a Coupler with Double-Combined ...

Based on the propagation principle of Gaussian beams and the coupling requirements, the coupling mechanism of the fiber coupler and the coupling mismatch between the coupler is...

FiberPort Collimators / Couplers

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