

Energy-efficient custom-designed optical directional coupler



Overview

Abstract: Directional couplers (DCs) are the basic elements for constructing various silicon photonic devices, including Mach–Zehnder switches (MZSs). Here, we propose a novel 2×2 bent directional couplers based on Bézier curves designed with an efficient semi-inverse design method. However, it is challenging due to the coupling between fibers and waveguides, which is highly sensitive. The design and fabrication of a compact, low-loss, broadband directional coupler (DC) based duplexer operating in the near-infrared (NIR) region are demonstrated. The duplexer exhibits high selectivity and coupling efficiency (CE), for target wavelengths of 1530 nm and 1653. Based on Finite Difference Eigenmode, Finite-Difference Time-Domain simulations, and experimental measurements. A directional coupler serves as an essential passive component in integrated photonic systems, allowing precise splitting or combining of optical signals between two closely. Directional couplers are essential components in integrated photonics.



Article Content

Optimal design of coupling waveguide structure for adiabatic optical ...

Abstract The optimal design of coupling waveguide structure for adiabatic optical directional full couplers (AODFC) based on weighted sin-square function (SSF) and raised-cosine

Robust Geometrical Dimensions in Uniform Directional Couplers

We experimentally demonstrate the efficiency of these stationary geometrical dimensions in a single-coupler design and subsequently utilize them to fabricate a quantum two-photon

Communication Ultra-Broadband and Compact 2×2 3-dB Silicon

The 2×2 3-dB couplers are one of the most widely used and important components in silicon photonics. Here, we propose an ultra-broadband and compact 2×2 3-dB adiabatic coupler defined by b

Robust Characterization of Integrated Photonics Directional Couplers

To address these challenges, we propose a novel direct measurement technique that offers greater robustness to variations in optical interfaces, while by-passing extinction ratio

Tunable Directional Couplers for High Contrast Optical Meshes

We describe the operation, design, and fabrication of MEMS-tunable silicon-photonics directional couplers, with potential for smaller footprint, less sensitivity to fabrication errors, and

Directional Coupler

Directional coupler is a basic function in an integrated photonic circuit, in which energy of the optical signal is coupled between adjacent optical waveguides.

Design of Optical Fiber 50/50 Y Coupler & 60/40 Y Coupler & Their

“Design of Optical Fiber 50/50 Y Coupler & 60/40 Y Coupler & Their Use Cases” is my graduate project submitted in partial fulfillment of the requirements for the degree of Master of Science in Electrical

Microwave Engineering

A Directional coupler is a device that samples a small amount of Microwave power for measurement purposes. The power measurements include incident power,

Multi-Octave All-Dielectric Directional Coupler Using

In this work, a terahertz-range handheld integrated-photonic directional coupler is reported with broad operation bandwidth spanning more

Chapter 11

The optical directional coupler, analogous to the microwave element of the same name, consists of parallel channel optical waveguides sufficiently closely spaced that energy is transferred from one to

Design of All-Optical Directional Coupler Using

Request PDF | Design of All-Optical Directional Coupler Using Plasmonic MIM Waveguide for Switching Applications | In this paper, we have

Optical Directional Couplers | Springer Nature Link

The optical directional coupler, analogous to the microwave element of the same name, consists of parallel channel optical waveguides sufficiently closely spaced that energy is transferred from one to

Switching behavior engineerable, electro-optic directional couplers in ...

In optical circuits, directional couplers usually work on two parallel and closely spaced waveguides, enabling the exchange of energy between modes of the two waveguides via the

Optical Directional Couplers and their Applications

Qualitative Description of the Operation of Directional Couplers Marcatili's Improved Coupled-Mode Equations Directional Couplers with Uniform Cross Section and Constant Spacing

Designing Smarter Directional Couplers with Parametric

In this tutorial, we'll uncover the benefits of creating a parametric model for directional couplers, leveraging the advanced layout and model-building

Fabrication Tolerant Directional Coupler

We present the design of a fabrication-tolerant directional coupler in a passive photonic integrated chip fabricated on Imec's iSiPP50G silicon photonics platform.

High-performance 2×2 bent directional couplers designed with an ...

Abstract: Directional couplers (DCs) are the basic elements for constructing various silicon photonic devices, including Mach-Zehnder switches (MZSs). Here, we propose a novel 2×2

Design of All-Optical Directional Coupler Using Plasmonic ...

The proposed 10-dB directional coupler and 3-dB directional coupler feature good energy confinement, ultra-compact, and low propagation loss, which has potential applications in photonic integrated

Broadband On-Chip Directional Coupler with Oblique

Directional coupling of light at the nanoscale plays a significant role in both fundamental research and practical applications, which are crucial for the

Highly efficient and selective integrated directional couplers for ...

This paper focuses on the design, optimization, and characterizations of a low-loss, compact directional coupler-based duplexer.

Low-Loss Silicon Directional Coupler with Arbitrary Coupling Ratios for ...

Abstract—We demonstrate a design for a high-performance 2×2 splitter meeting the essential requirements of broadband coupling, support for arbitrary coupling ratio, ultra low-loss, high

Directional Coupler

A directional coupler is defined as a device that couples only to waves traveling in a specific direction, allowing for the measurement of forward and reverse power levels in transmission

Design of a Directional Coupler with Independently Adjustable Power ...

This paper presents a directional coupler with independently adjustable power divisions and phase differences. The proposed directional coupler is composed of a compact 90° coupler with tunable

Robust Characterization of Integrated Photonics Directional Couplers

Consequently, the variability in coupling location and efficiency can greatly influence measurement accuracy, making it difficult to isolate and quantify the true performance of the optical

Fiber Directional Coupler

A fiber directional coupler is defined as an optical component that splits and combines optical signals by utilizing the interference of evanescent waves from two closely positioned fibers, enabling power

Design and fabrication of a photonic crystal directional coupler for ...

We have designed and fabricated a photonic crystal directional coupler for use as an optical switch. The design is for the SOI material system, and includes a silica overlayer and infilling of the etched

Optical Coupler

A directional optical coupler can be made by simply fusing fibers together for a certain length known as fused fiber coupler, or using coupled ridge optical waveguides on a PLC.

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