DsynQ

Engineering Report - AI-Assisted Photonic Design

Beam Splitter · 1550 nm

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Design Summary

This 50:50 beam splitter is designed on a silicon photonics (SOI) platform for operation at a 1550 nm wavelength, with the optimization objective of minimizing insertion loss. The analytic estimates indicate a transmission efficiency of 97.2%, equivalent to an insertion loss of 0.123 dB (these are the same transmission expressed two ways), across a bandwidth of 90.0 nm. The device occupies a compact footprint of 25.5 × 1.75 µm and employs a 0.5 µm waveguide width, a 0.26 µm gap, a 10 µm bend radius, and a coupling length of approximately 20.76 µm. It achieves a strong fabrication score of 95.6/100, indicating good manufacturability. These figures are analytic estimates rather than results from a physical simulation and should be validated experimentally.

Specification

Component	Beam Splitter
Wavelength	1550 nm
Objective	Minimize Insertion Loss
Platform	Silicon Photonics (SOI)
Split Ratio	50:50
Constraints	minimal insertion loss
Parameters	gap_um=0.26, wg_width_um=0.5, bend_radius_um=10, coupling_length_um=20.763249999999992

Estimated Performance

Efficiency	97.2 %
Insertion Loss	0.12 dB
Bandwidth	90 nm
Fabrication Score	96 / 100

Layout

Footprint	25.5 × 1.75 µm
Layers	2