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 with the objective of minimizing insertion loss at a 1550 nm operating wavelength. Analytic estimates indicate an efficiency of 97.2%, corresponding to an insertion loss of 0.123 dB, which are the same transmission expressed two equivalent ways. The design achieves a bandwidth of 90.0 nm within a compact footprint of 25.5 × 1.75 µm, using a coupling length of approximately 18.055 µm, a 0.5 µm waveguide width, a 0.23 µm gap, and a 10 µm bend radius. Its fabrication score of 94.2/100 suggests good manufacturability under standard SOI processes. These figures are derived from analytic modeling rather than full physical simulation.

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=0.23, length_um=40, wg_width_um=0.5, bend_radius_um=10, coupling_length_um=18.054999999999996

Estimated Performance

Efficiency	97.2 %
Insertion Loss	0.12 dB
Bandwidth	90 nm
Fabrication Score	94 / 100

Layout

Footprint	25.5 × 1.75 µm
Layers	2