Ring Resonator

Last Updated: August 2019

Description

Useful for filters, sensors, etc. and to extract fabrication non-uniformity.

Model Name

ebeam_dc_halfring_straight

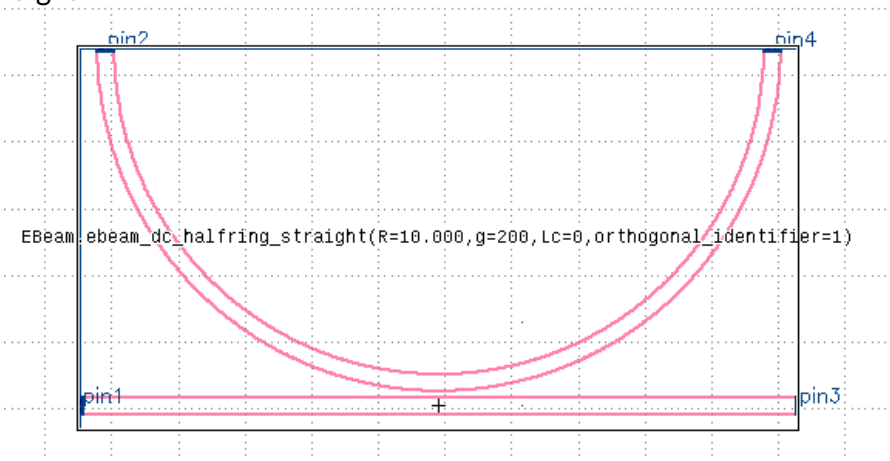

Fig. 1: Compact Model of Half Ring Resonator

Compact Model Information

- Support for TE and TM polarization using the respective orthogonal identifier parameter
- Performance:
  - Found that for EBeam process with existing wafer stock, the wavelength variation for resonators across the chip was +/- 3 nm. Grating coupler insertion loss varied by +/- 1.5 dB.
  - Un-optimized ring: Line-width = 40 pm; Extinction Ratio = 6 dB

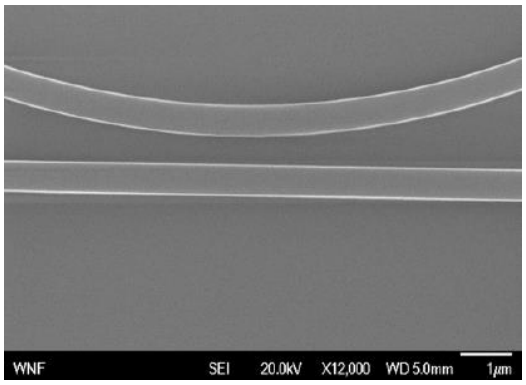

Fig. 2: SEM Picture of Ring Resonator

Parameters

Parameter	Default Value	Notes
Radius (microns)	10	
Waveguide Width (microns)	0.5	
Gap (microns)	0.2	
Coupler Length (microns)	0	
Orthogonal Identifier	1	1 = TE, 2 = TM

Simulation Results

From [Source]:

[Insert Simulation Results]

Fig. 3: Simulation Results for Ring Resonator

Experimental Results

From L. Chrostowski, et al., "Impact of Fabrication Non-Uniformity on Chip-Scale Silicon Photonic Integrated Circuits", Optical Fiber Conference, 2014:

- Negative linear relationship between group index and resonant wavelength
- Grating couplers are primarily sensitive to etch depth

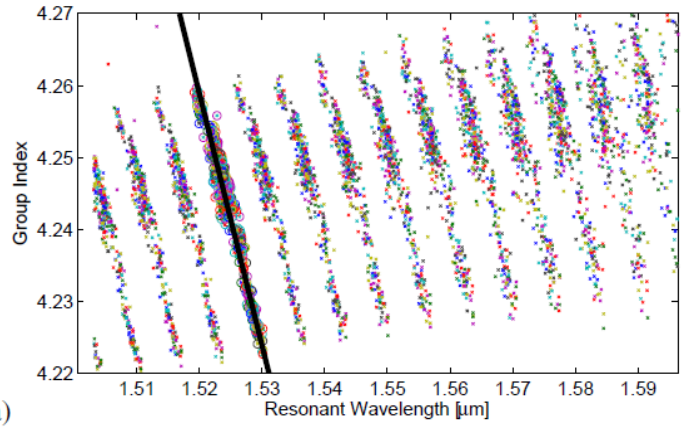

Fig. 3: Extracted Group Index Versus Resonance Wavelength for All Experimented Resonators

Additional Details

- Design Tools & Methodology: Eigenmode (Lumerical Solutions), Scripted mask layout (Mentor Graphics Pyxis)

Reference

L. Chrostowski, et al., "Impact of Fabrication Non-Uniformity on Chip-Scale Silicon Photonic Integrated Circuits", Optical Fiber Conference, 2014 http://dx.doi.org/10.1364/OFC.2014.Th2A.37