Bragg Gratings

Last Updated: August 2019

Description

Uniform waveguide Bragg gratings, 1st order, TE polarization. This design provides a simple method of varying the grating strength (kappa) by changing the corrugation width (0 to 150 nm) and/or grating misalignment. The gratings can be either rectangular or sinusoidal (sinusoidal have more predictable performance).

Model Name

ebeam_bragg_te1550

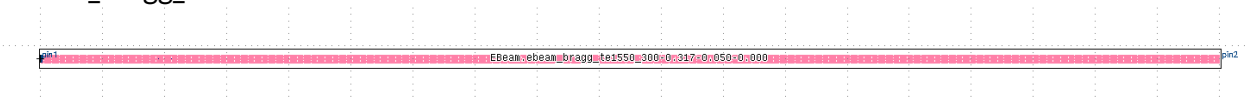


Fig. 1: Compact Model of Bragg Gratings

Compact Model Information

- Support for TE polarization
- Operating at 1550 nm wavelength
- Performance:
  - TE – TBD
- Grating misalignment:
  - Kappa ranging from ~0 to 140,000 m-1, for a fixed ΔW = 50 nm, with misalignment technique
  - Measured with oxide cladding.
- Number of fabrication iterations (separate runs) to get to published results: 1
- Number of variations fabricated: 10

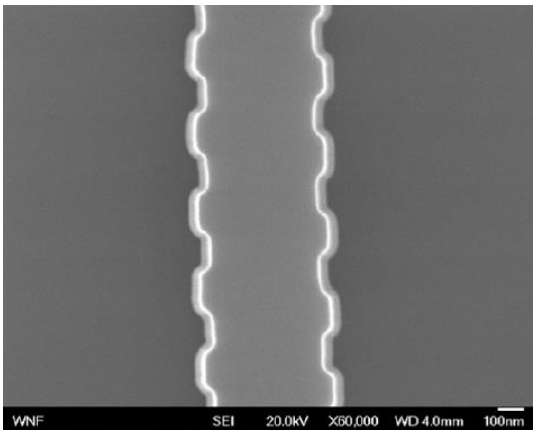


Fig. 2: SEM Picture of Bragg Gratings

Parameters

Parameter	Default Value	Notes
Number of Grating Periods	300	
Grating Period (microns)	0.317	
Corrugation Width (microns)	0.05	
Grating Misalignment (microns)	0	
Grating Type	False	False = Rectangular True = Sinusoidal
Waveguide Width (microns)	0.5	

Simulation and Experimental Results

From Xu Wang, et al., "Precise control of the coupling coefficient through destructive interference in silicon waveguide Bragg gratings":

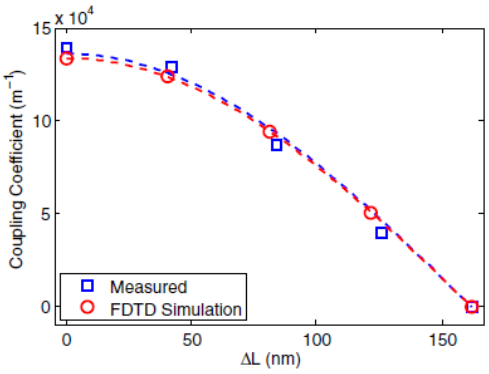


Fig. 3: Simulation and Experimental Results for Coupling Coefficients as a Function of misalignment Length for Gratings with Fixed Corrugation Width (ΔW = 50 nm)

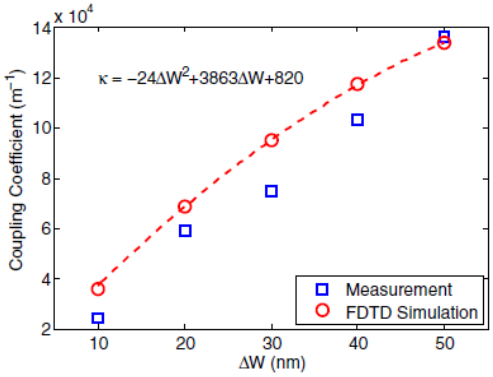
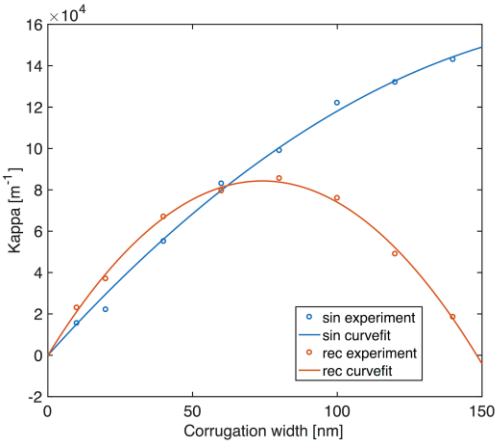
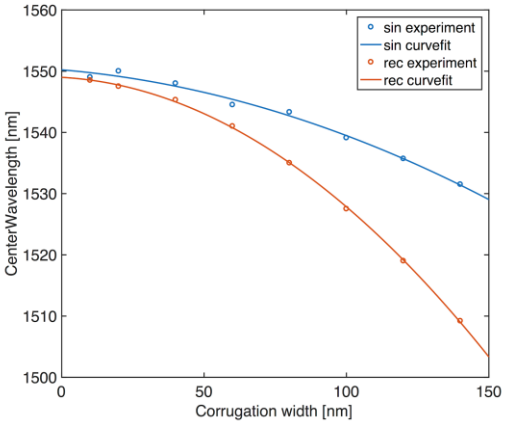


Fig. 4: Simulation and Experimental Results for Coupling Coefficients as a Function of Corrugation Width for Gratings with No Misalignment (ΔL = 0)

http://github.com/lukasc-ubc/SiEPIC_EBeam_PDK/

From Ajay Mistry:





Additional Details

- Design tools & methodology:
  - Hand-drawn layout (kLayout)
  - Post-fabrication modeling using band-structure calculation in 3D-FDTD (Lumerical FDTD Solutions)
- Measurement Data from 11/2017 Fabrication Run by Applied Nanotools: https://github.com/lukasc-ubc/edX-Phot1x/tree/master/2017_Bragg_grating

Reference

Xu Wang, et al., "Precise control of the coupling coefficient through destructive interference in silicon waveguide Bragg gratings", Optics Letters, vol. 39, issue 19, pp. 5519-5522, 10/2014 http://dx.doi.org/10.1364/OL.39.005519