

Lab #2 – Simulating Y-Branches – 100 points.

Submission Link: <https://www.dropbox.com/request/dDwA6oeXa9Q0ZInlX6oj>

Due: October 6, 2018 at 11:59 pm (submission link will be deactivated after 11.59 pm).

Please upload a **zip file including your simulation files from Lumerical tools and a lab report.** What should be included in the lab report? Summary of your approach (how do you simulate a y-branch) and your approach, all the results and plots from the simulations below. This lab requires simulations in **both** MODE and FDTD.

VarFDTD Simulations of a Y-Branch

Objective: Determine the insertion loss of the Y-Branch

Tutorial:

- Simulations using Lumerical MODE Solutions and using the 2.5D FDTD solver described in more detail on [Lumerical's web page](#)
- Scripted example has mode details (see below)
- FDTD simulations

FDTD Simulation Details:

- GDS Layout import of the Y-Branch geometry; material settings;
- VarFDTD solver; simulation volume; PML boundaries;
- Mode source at the input waveguide; wavelength settings;
- Check slab mode profile in varFDTD, as in the Effective index method;
- Mode source profile;
- Monitors; frequency-domain field and power in output waveguides;
- Check “core” effective index of slab waveguide;
- Run 2D FDTD simulations;
- Visualize transmission versus wavelength; (show this in your report)

Y-Branch layout GDS file used for this simulation: Compact_YBranch_open.gds
(https://www.dropbox.com/s/ywuukt2y3uah4yf/Compact_YBranch_open.gds?dl=0)

Script for Y-Branch simulation**Objectives: Simulate the insertion loss of a Y-Branch using FDTD**

Using Lumerical MODE Solutions – 2.5D (varFDTD) – fast simulation;

Using Lumerical FDTD Solutions – 3D – more accurate simulation;

The script will run in either MODE or FDTD Solutions.

Obtain the **S-Parameter** for the Y-Branch (generated file: `sparams_Ybranch_varFDTD.dat`). The S-parameters describe the transmission (insertion loss), the reflection (return loss) and the various couplings from one port to another. For a 3-port device, this is a 3x3 matrix. It is also wavelength dependent.

We will use these S-parameters in the Photonic Circuits section. S-Parameters are described in Chapter 9 of the "Silicon Photonics Design" textbook.

Files

- Script for Y-Branch simulations (*Ybranch_varFDTD_3DFDTD.lsf*), and the GDS layout for the Y-Branch (*Compact_YBranch_open.gds*):
- Ybranch_varFDTD_3DFDTD.zip
https://www.dropbox.com/s/y3sl1pe2v1v2r01/Ybranch_varFDTD_3DFDTD.zip?dl=0