Project 2 Design Review

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1 Design Process:

1.0 Waveguide Geometry:

The Waveguide Geometry has a 350nm width and is TE polarized at 1310nm

1.1 FDTD Results:

The FDTD results ensure that we have a central wavelength of 1310. For the purposes of Project 2 the structure is Air cladded. This led to a Bragg Period of 287nm. Figure 1 shows the XY View of the Bragg grating.

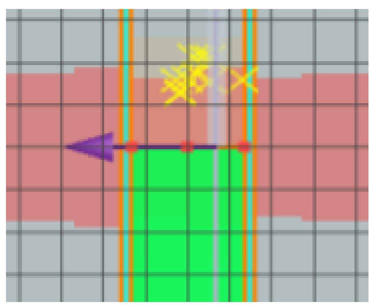

Figure 1: Bragg Grating XY View

Mesh cells was set to 4 to ensure clean results were used

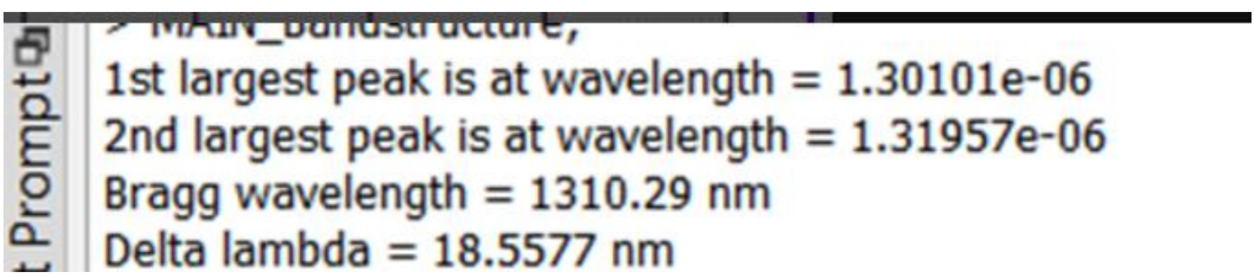

Figure 2: FDTD Simulation Results

The plot shows the results of the FDTD simulation which shows the Delta lambda

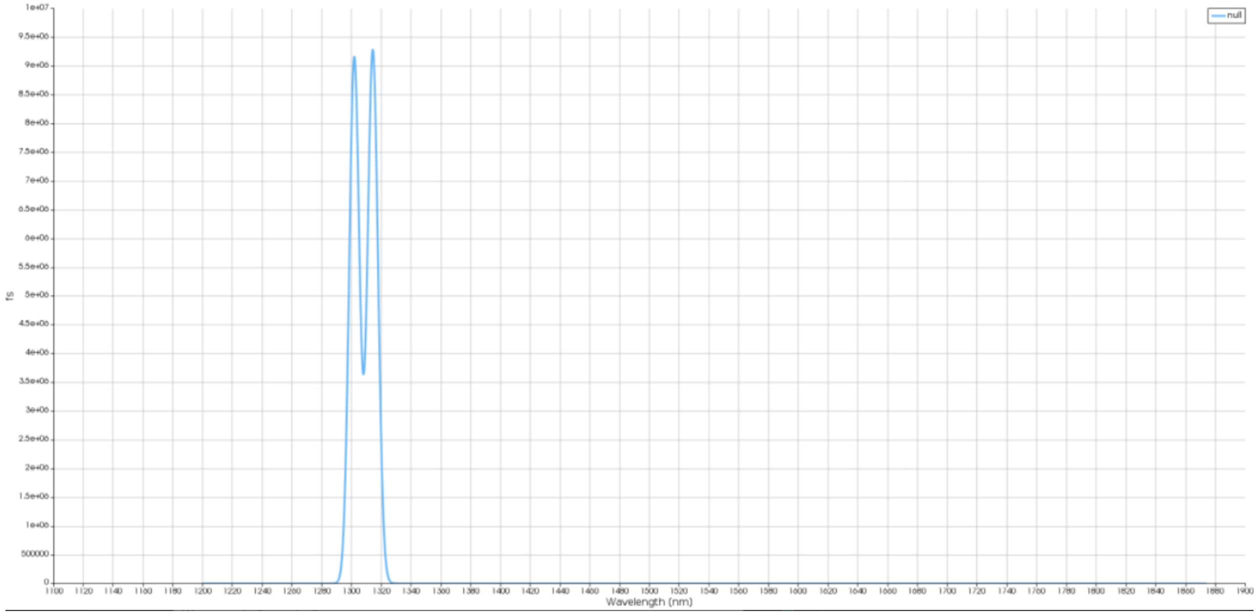

Figure 3: FDTD Simulation

The κ obtained from the FDTD simulation was 309,936 using the formula $\kappa = \pi n_g \frac{\Delta\lambda}{\lambda_B^2}$ this is the coupling coefficient we will use for our INTERCONNECT coupling coefficient for our Bragg Gratings. FDTD also gives the delta lambda and the group index can be found using mode discussed further.

1.2 Mode Results:

After finding the Bragg period MODE gives us the effective index and group index for our structure. We define the simulation region and select the option “near n” for the purposes of Project 2 the structure is Air cladding

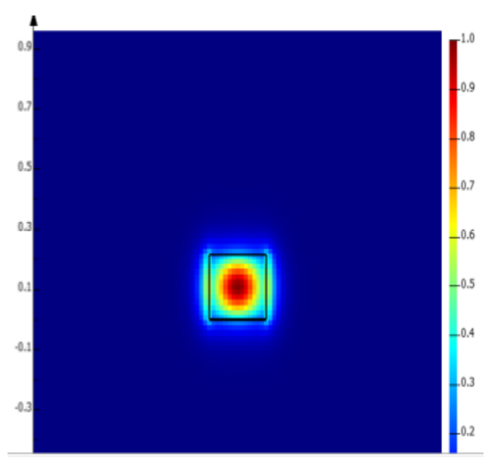

Figure 4: Simulated cross-section of silicon strip waveguide at 1310nm

Finally we can use these parameters from FDTD and Mode to transfer to interconnect and view the results in Interconnect of the Transmittivity and Reflectivity and obtain Quality Factor results.

3.1 Interconnect Results

κ 1/m	n_g	n_{eff}	$\#\ of\ periods\ (Bragg)$	$Bragg\ period$	Loss db/m
309936	4.64475	2.3566	13	0.287nm	300

Table 1: Parameters for Interconnect

With the parameters described we can setup an Interconnect Circuit with a cavity and 2 Bragg gratings and utilize the parameters to get a graph of the transmittivity and reflectivity. Figure 5 shows the Circuit:

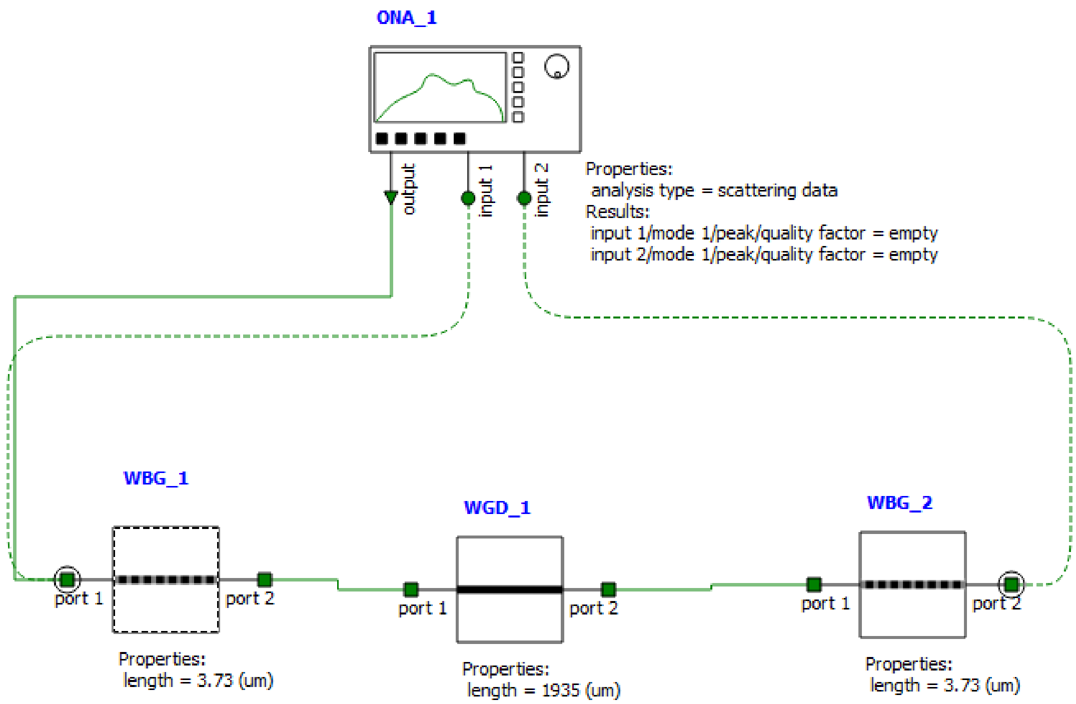

Figure 5: Interconnect Circuit

Notably the Bragg length is 3.73 μm and the Cavity for this design is 1935 μm. This yields the following plot shown in Figure 6:

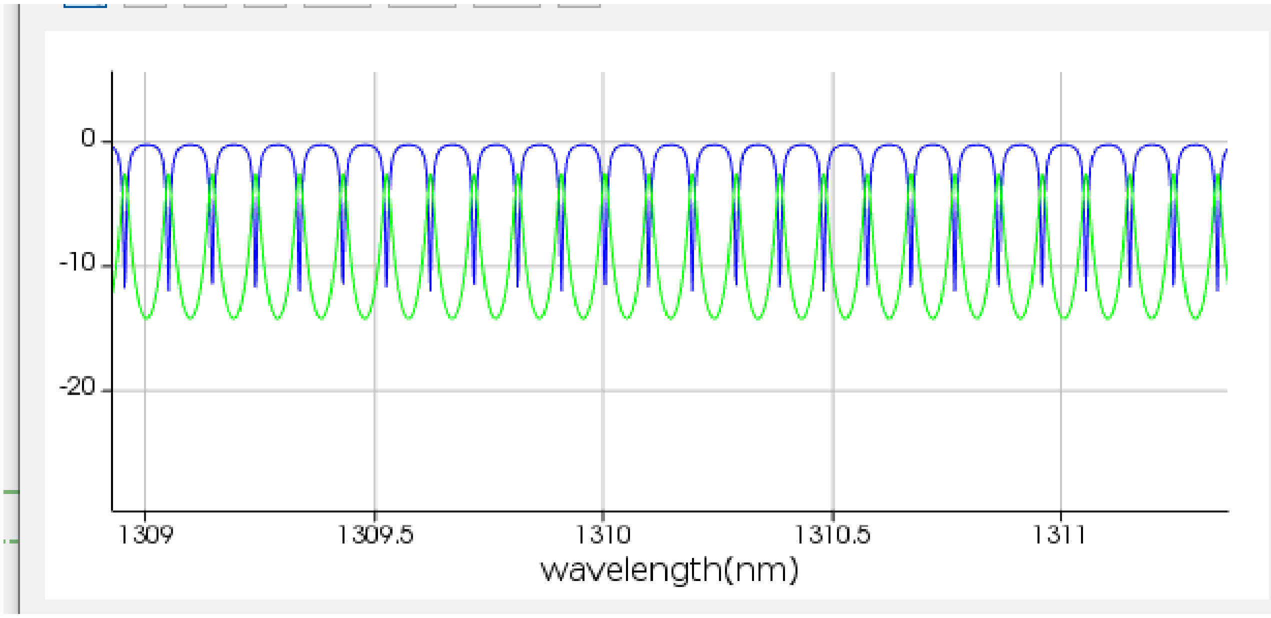

Figure 6: Lumerical Results dW = 50nm

Notably we notice that at approximately 1310nm the transmittivity is above -10dB which ensures the signal will be captured.

The Q factor found was approximately 23000

Finally, we can make the Structure in KLayout

4.1 KLayout:

In KLayout I made the circuit with a cavity length of 1935 nm which has a grating length of 3.73μm which is 13 periods

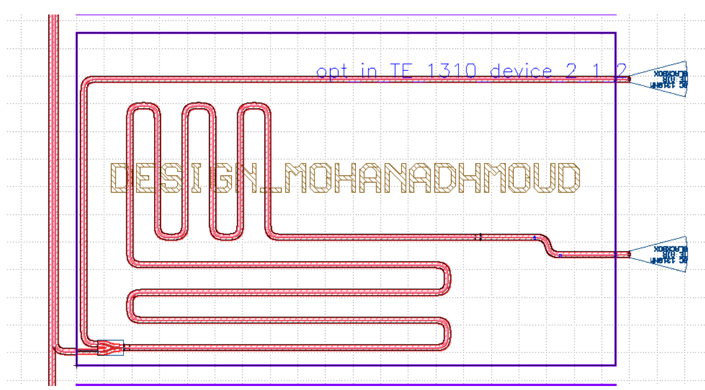

Figure 7: KLayout Floor Plan Mask Layout

Figure 7 shows 3 structures with varying cavity lengths and bragg grating lengths.