Mode Simulation

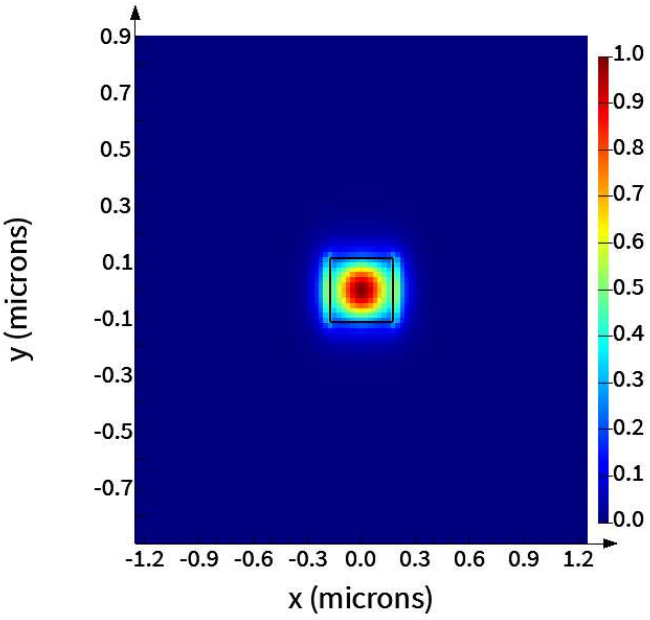


Fig. x E intensity of 350nm x 220nm Si, SiO2 Waveguide at 1310nm Wavelength

Eigensolver Analysis

Mode list

mode #	effective index	wavelength (μm)	loss (dB/cm)	group index	TE polarization fraction (Ex)	waveguide TE/TM fraction (%)	effecti (μm
1	2.430493+1.578473e-09i	1.31	0.00065760	4.495546+3.721512e-09i	98	70.17 / 84.15	0.143214
2	2.012025+1.393887e-09i	1.31	0.00058070	4.623911+5.776500e-09i	5	62.29 / 87.87	0.200939
3	1.466703+3.341238e-10i	1.31	0.00013920	2.001103+2.005156e-09i	55	93.38 / 98.94	0.957318

First Few Modes - 4.495546

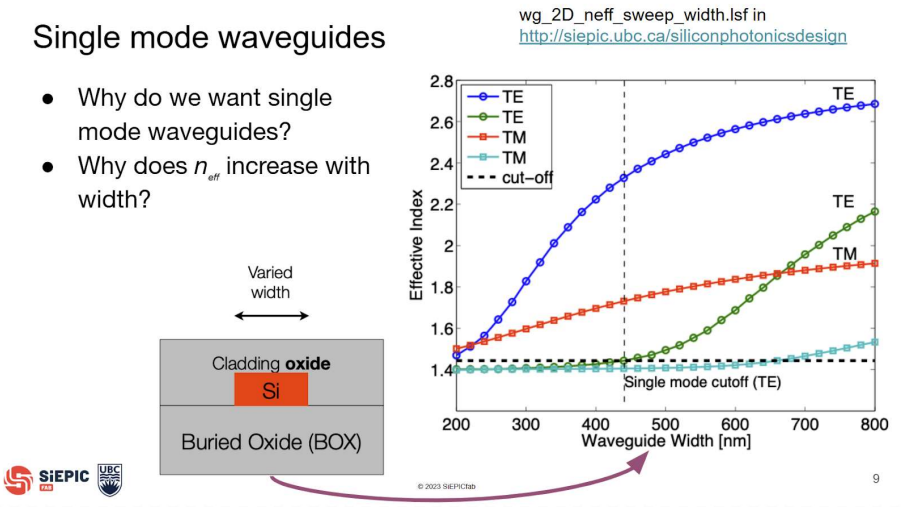
Q: I need to find the group index to calculate the FSR. Would the group index be that of the first mode? the second? Should I look at the first **TE polarized** or TM polarized mode? does it matter?

- ChatGPT hints tha most SIP waveguides are designed for TE modes due to lower propagation loss and better confinement in high-contrast waveguides
- **TE polarized** because lasers normally do that yeah

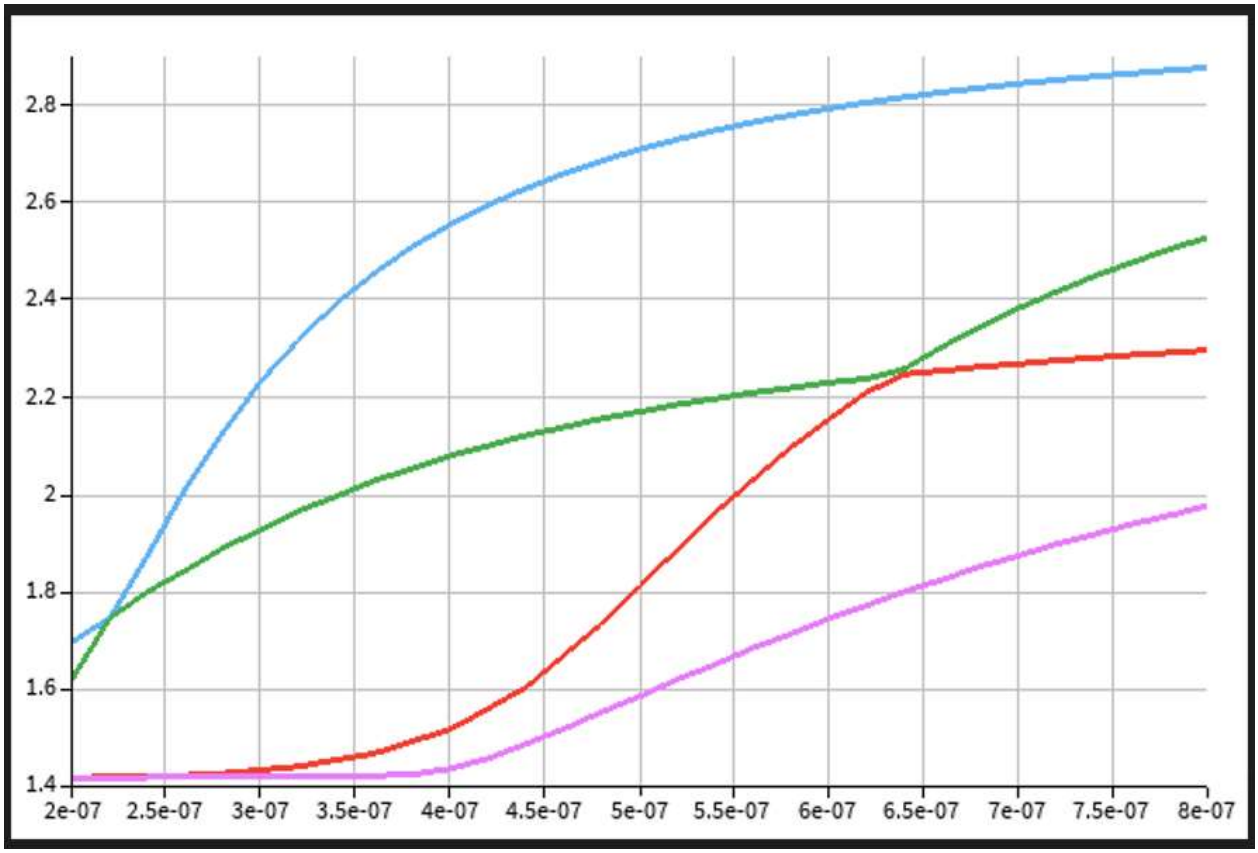
Q: How do I determine if my waveguide only supports one mode?

- My guess is that we can look at the lecture slide for waveguides. We see that below a waveguide width of about 420nm, our waveguide only supports one mode.
- You need to run his script again at 1310nm because it assumes 1550nm
- We don't really have to resweep because this is common
- Whichever index the effective index is closer to means it spends more time there

- Like since the center is higher index, higher index means more confined because its more similar to the core
- Multiple nodes is similar to noise in that now your light splits into multiple kinds of waves
- Small bends let the higher order



- **Q:** Is there a way to tell in Ansys Mode?



Sweep for 1310 nm Waveguide (not sure which mode is which exactly but likely similar to above. Red and green seem to swap places at the end, look more into it later

Google sheets to be formatted later

	A	B	C	D
1	**Calculated Values**			
2	**Parameter**	**Value**	**Unit**	**Note**
3	Waveguide neff			MODE Simulation
4	Waveguide neg	4.495546		MODE Simulation
5	Waveguide loss			
6	Target Delta L	2667.462044	µm	
7	Target Delta L	2.667462044	mm	
8	Design 1			
9	MZI Length 1	16.789	µm	
10	Target MZI Length 2	2684.251044	µm	
11	Segment 1	69.931	µm	
12	Segment 2	2510.95	µm	
13	Segment 3	103.371	µm	
14	Actual MZ Length 2	2684.252	µm	
15	Difference From Target	-0.00095645734	µm	
16	Acutal Delta L	2667.463	µm	
17	Real FSR	24.99999104	GHz	
18				
19				

c			
Parameter	**Value**	**Unit**	**Note**
Number of Outputs	2		
Free Spectral Range (FSR)	25	GHz	
Maximum Floorplan Dimensions	605 x 410	µm	
Waveguide Width	350	nm	
Operating Wavelength	1310	nm	
Speed of Light	299792458	m/s	