



COMSOL® Design Tool: Tutorial 5

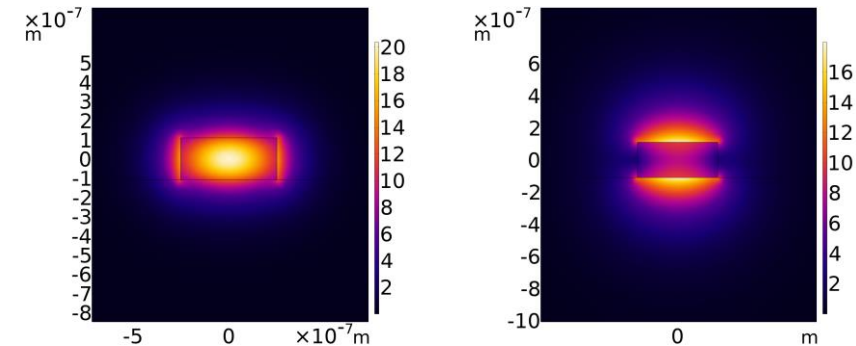
Manuel Kohli, Raphael Schwanninger

Silicon Waveguide

Parameter	Value
f0	c_cons/wl
n_clad	1
n_core	3.47
n_sub	1.45
sim_height	10*wg_height
sim_width	10*wg_width
wg_height	220[nm]
wg_width	750[nm]
wl	1550[nm]
mesh_size	??

Task 1:

- Build a model to simulate the mode of a waveguide



Hint:

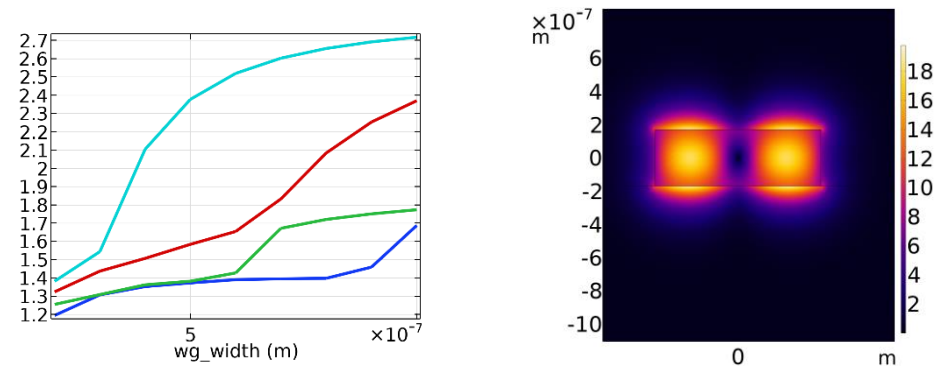
- Find a good mesh size by making it dependent on refractive index and wavelength. A parametric sweep could be used (parameter n_{eff} ?)
- Physics: don't use scattering boundary condition. Why? Test it.
- Study: Don't use a frequency domain study.

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Task 2:

- Analyze the multi-mode behaviour. At what size is no higher order TM mode allowed? At what size is only the TE mode supported?



Hint:

- First get an understanding how the parameters influence the supported mode (play around)
- Use parametric sweep and calculate several modes in each step
- The graph can be generated through "Table Graph". A table can be generated through "Derived Values: Global Evaluation"
- Each line in the graph represents a mode

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Parameter	Value
f0	c_cons/wl
n_clad	1.4457
n_core	1.4378
r_cladding	40 [um]
r_core	8 [um]
wl	1550[nm]
mesh_size	??

Task 3: Create a graph showing the supported modes in an optical fiber with respect to the core size. What size should the core be if you want a single-mode fiber?

Hint:

- The fiber is round
- Apply what you have learned in Task 1 & 2
- Single mode: there is a fundamental TE and fundamental TM mode. All higher-order modes are not guided ($n_{\text{eff}} < n_{\text{cladding}}$)

