



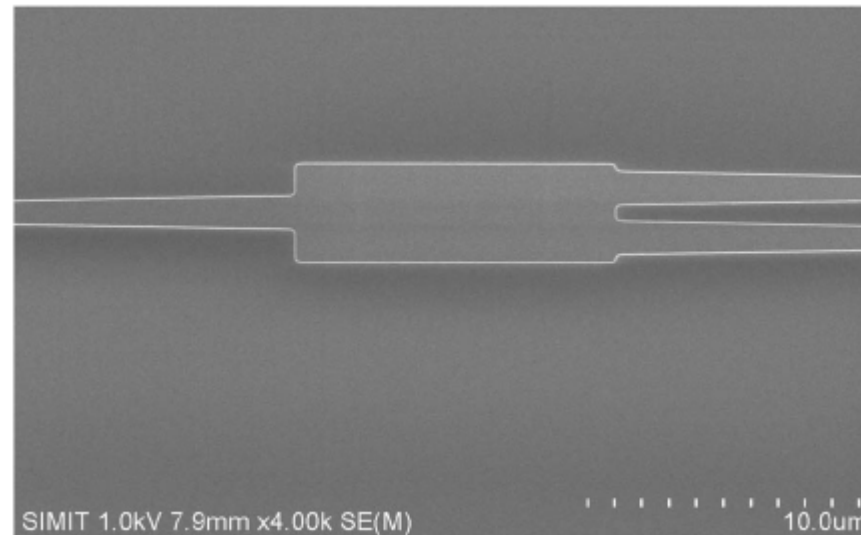
COMSOL® Design Tool:

Tutorial 6: S Parameters

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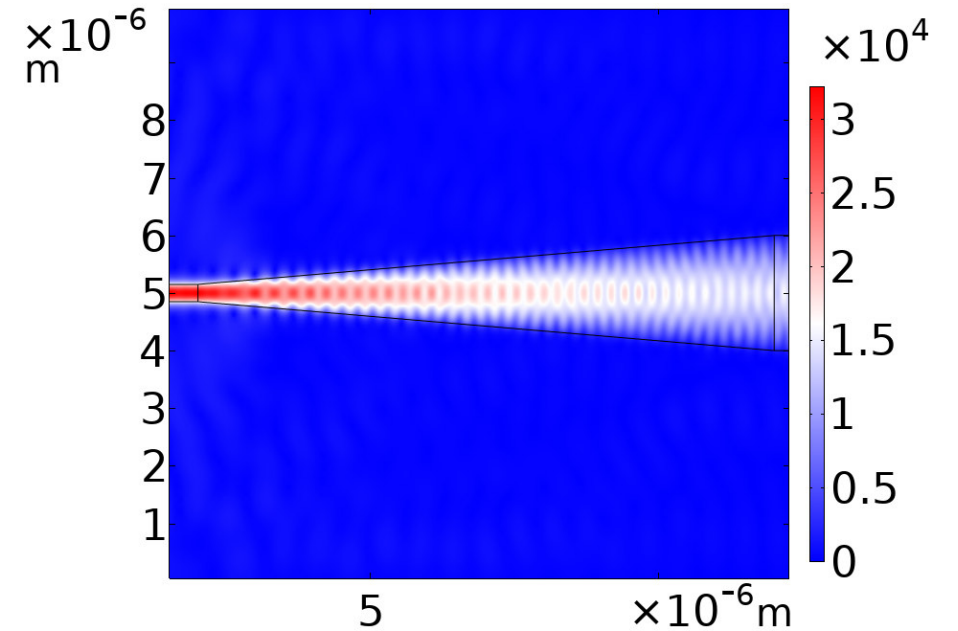
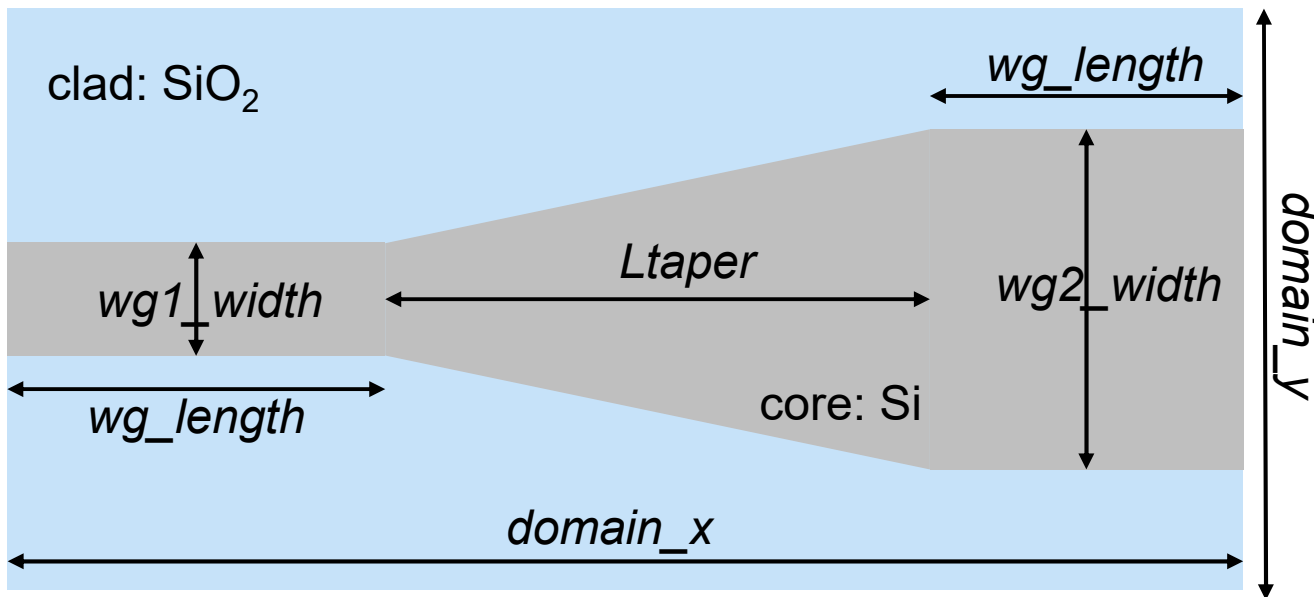
COMSOL Examples: Taper

- “Tapering”
- Sometimes, photonics design requires that waveguide also changes its width...
- Example is Multi – Mode – Interference coupler (one of the projects)



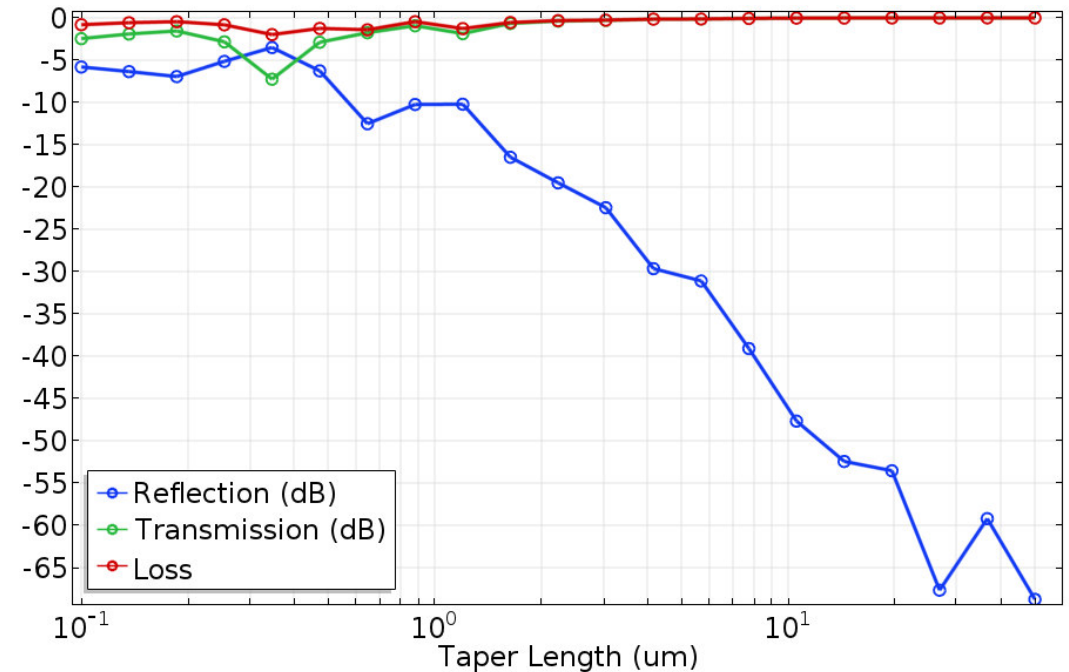
COMSOL Examples: Taper

- Tasks:
 - Plot transmission curve for different taper lengths
 - (Note: you can **add trapezoid or polygon** in COMSOL)
 - L_{taper} greater than 100 nm...



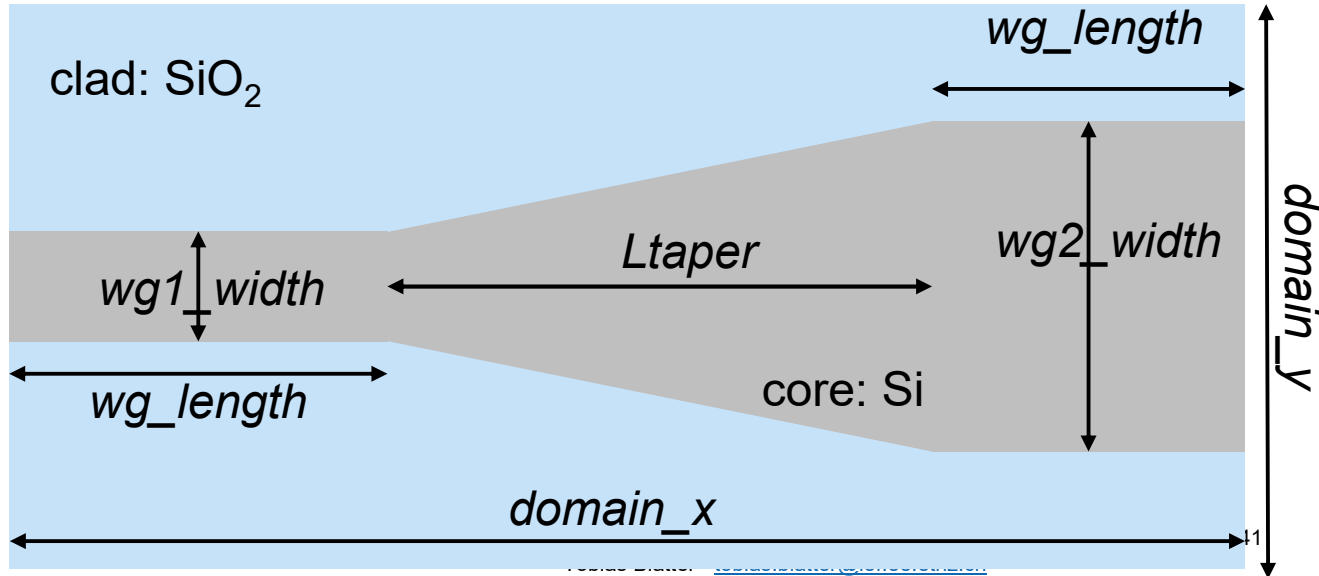
Next Steps: Analyze S-Parameters

- Parameter sweep taper length
- S-Parameters can be used to plot
 - Reflection
 - Transmission
 - Losses
- Hint:
 - Derive desired S-parameter values S_{xx}
 - Make a 1D-plot

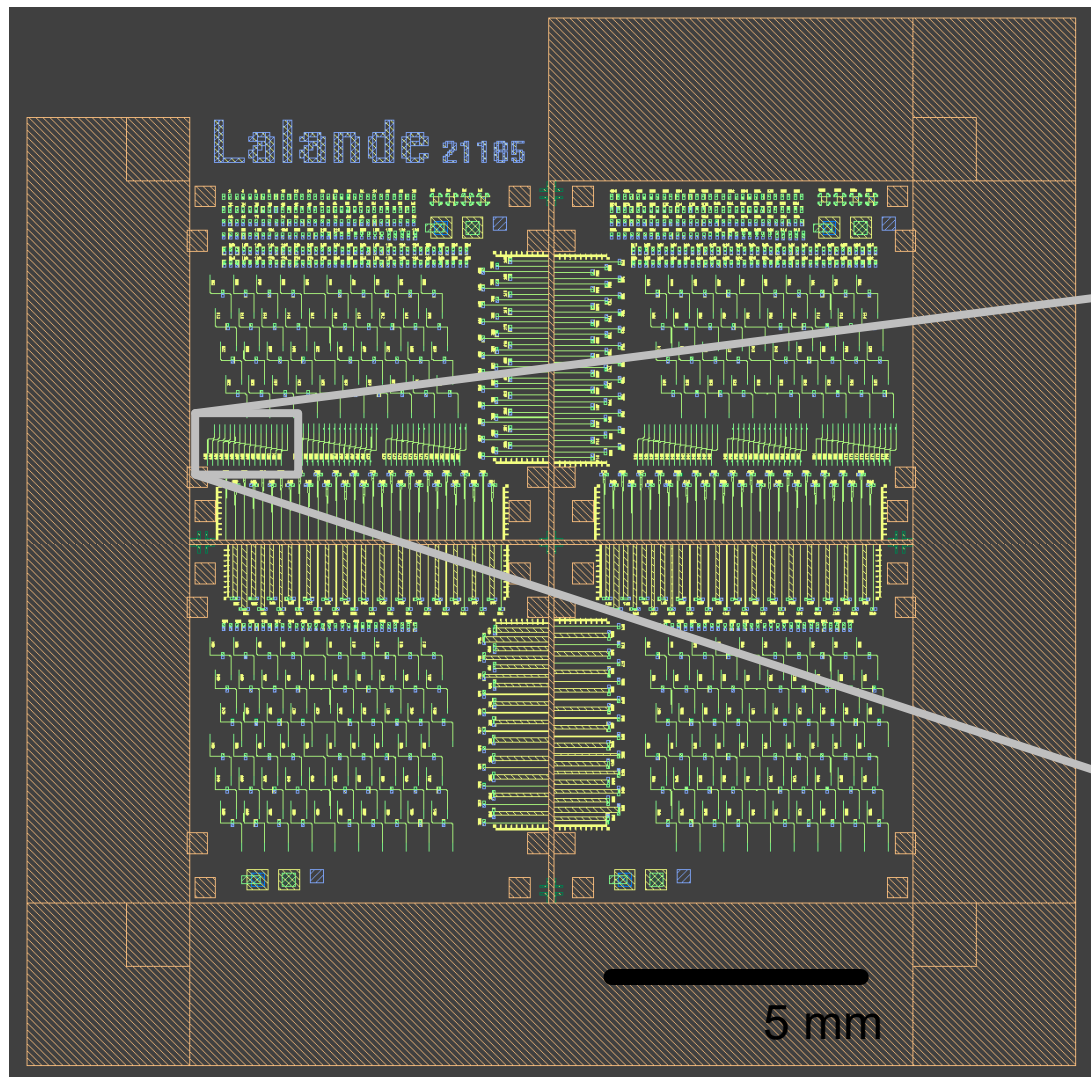




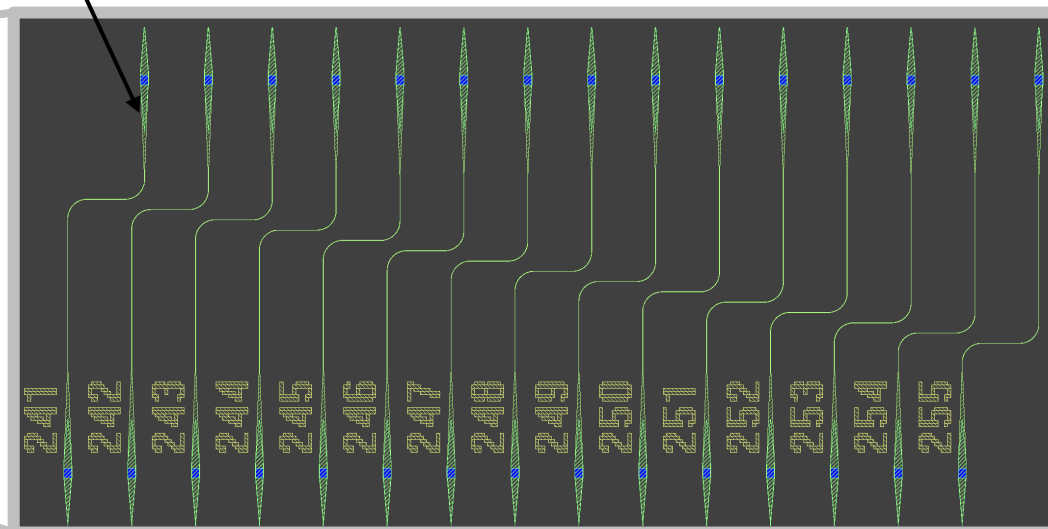
Name	Expression	Value	Description
lam0	1550[nm]	1.55E-6 m	wavelength
f0	c_const/lam0	1.9341E14 1/s	frequency
n_core	3.47	3.47	index of Silicon
n_clad	1.44	1.44	index of Silicon Dioxide
Ltaper	2[um]	2E-6 m	taper length
wg1_width	300[nm]	3E-7 m	1st wg width
wg2_width	2[um]	2E-6 m	2nd wg width
wg_length	2[um]	2E-6 m	waveguide straight lengths
domain_x	2*wg_length+Ltaper	6E-6 m	domain size in x
domain_y	5*wg2_width	1E-5 m	domain size in y



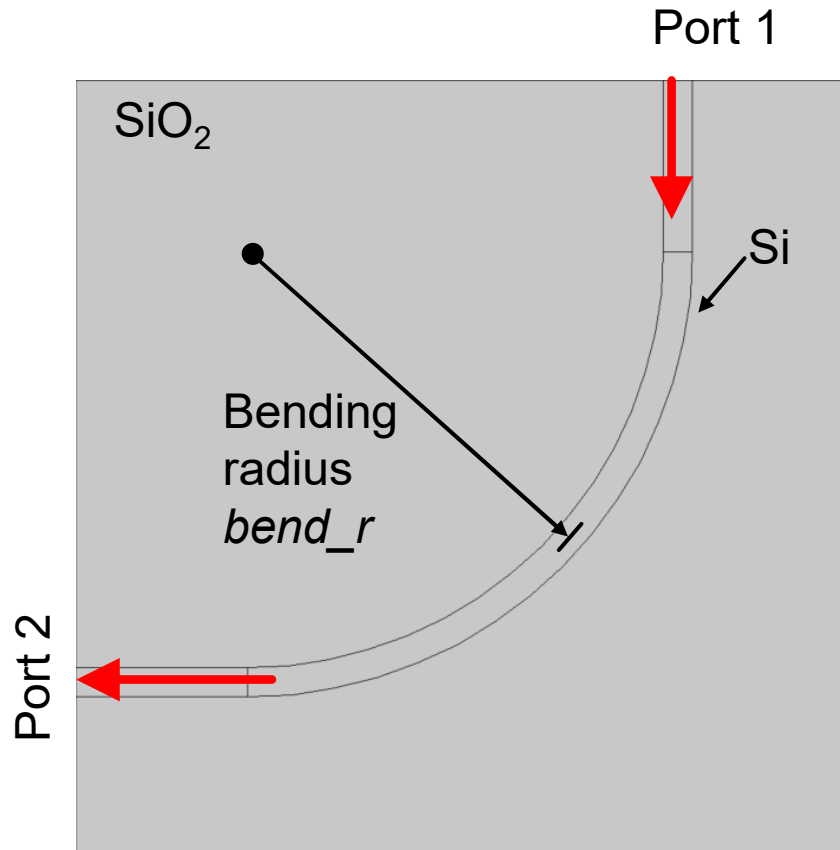
Waveguide bending



Tapers

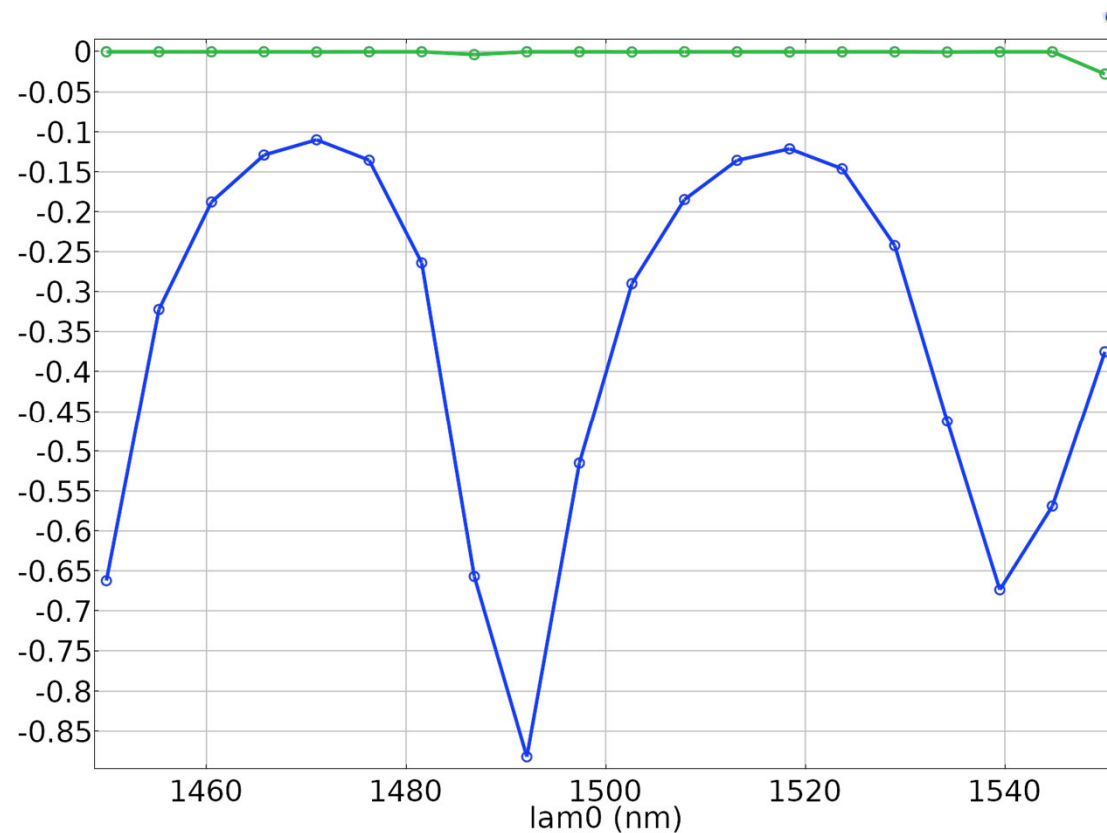
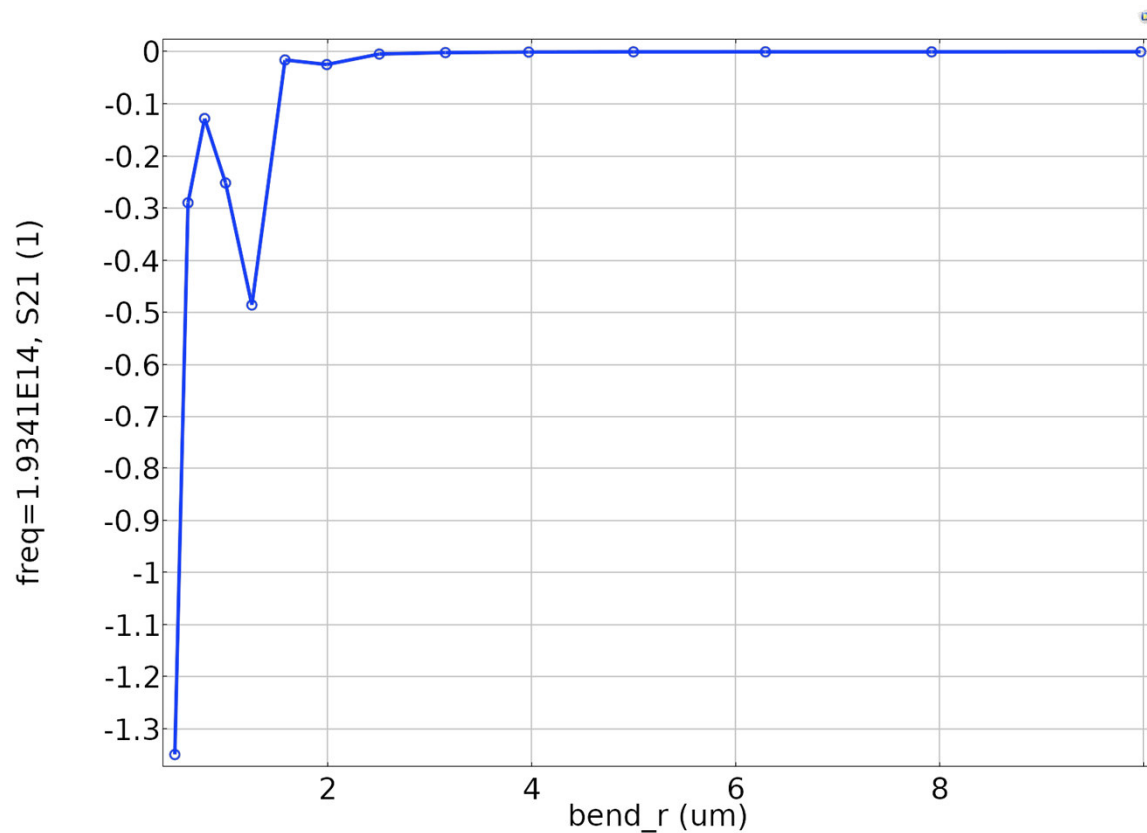


S-Parameters for Photonics: COMSOL Waveguide Bend



- WG bend with a circular segment with a radius $bend_r$
- $bend_r$ goes to the center of the WG
- We collect the power at port 2
- We calculate the transmission

Next Steps



Name	Expression	Value	Description
bend_r	0.5[um]	5E-7 m	radius of bent
Dx	bend_r+2*si_in	4.5E-6 m	width domain
Dy	bend_r+2*si_in	4.5E-6 m	height domain
si_in	2[um]	2E-6 m	straight length
nSi	3.47	3.47	Si index
nSiO2	1.46	1.46	SiO2 index
wSi	450[nm]	4.5E-7 m	width of wg
lam0	1550 [nm]	1.55E-6 m	wavelength
f0	c_const/lam0	1.9341E14 1/s	frequency

