



# P&S COMSOL<sup>®</sup> Design Tool

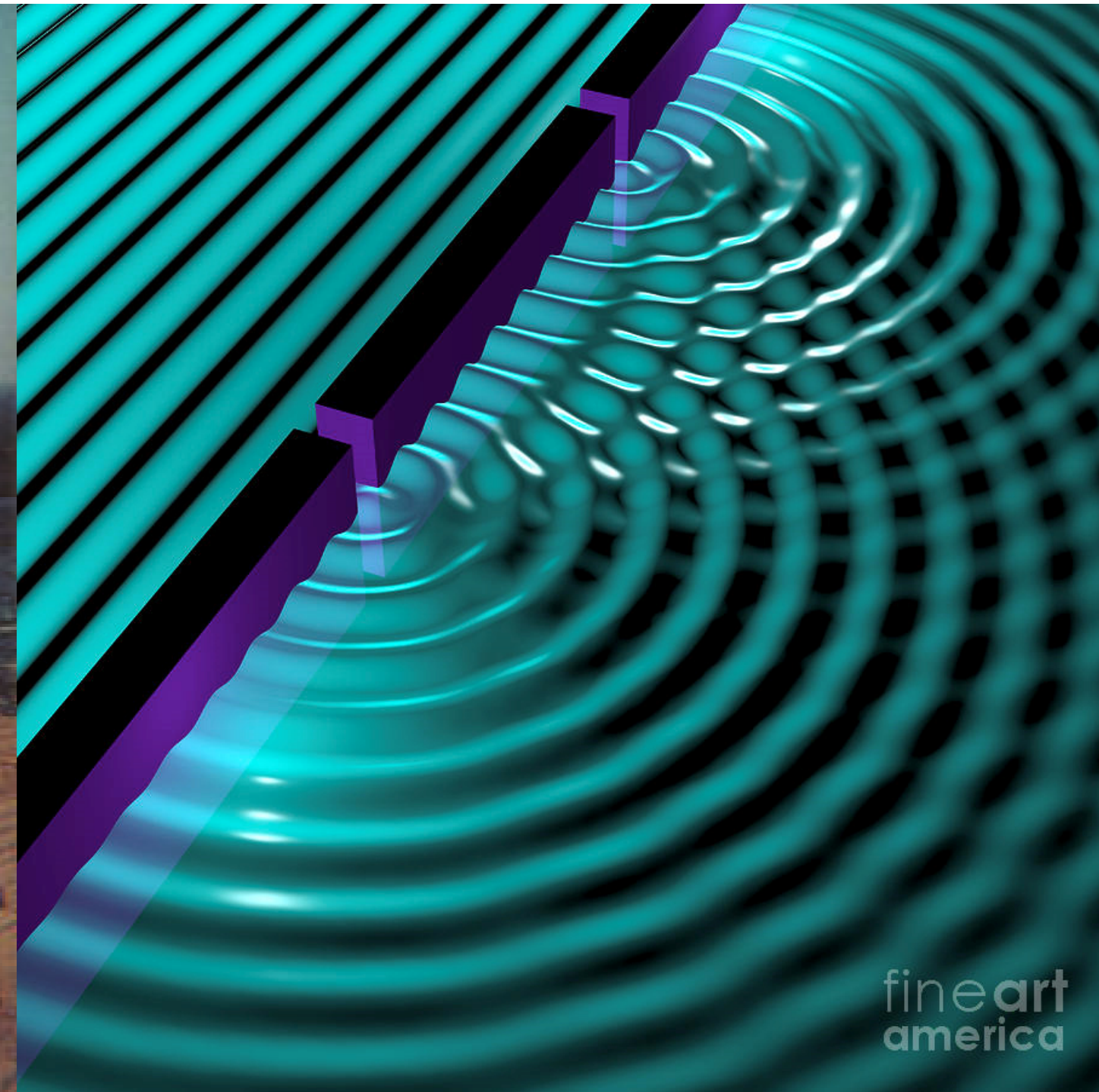
## Exercise Week 3: Introduction to COMSOL

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# Content

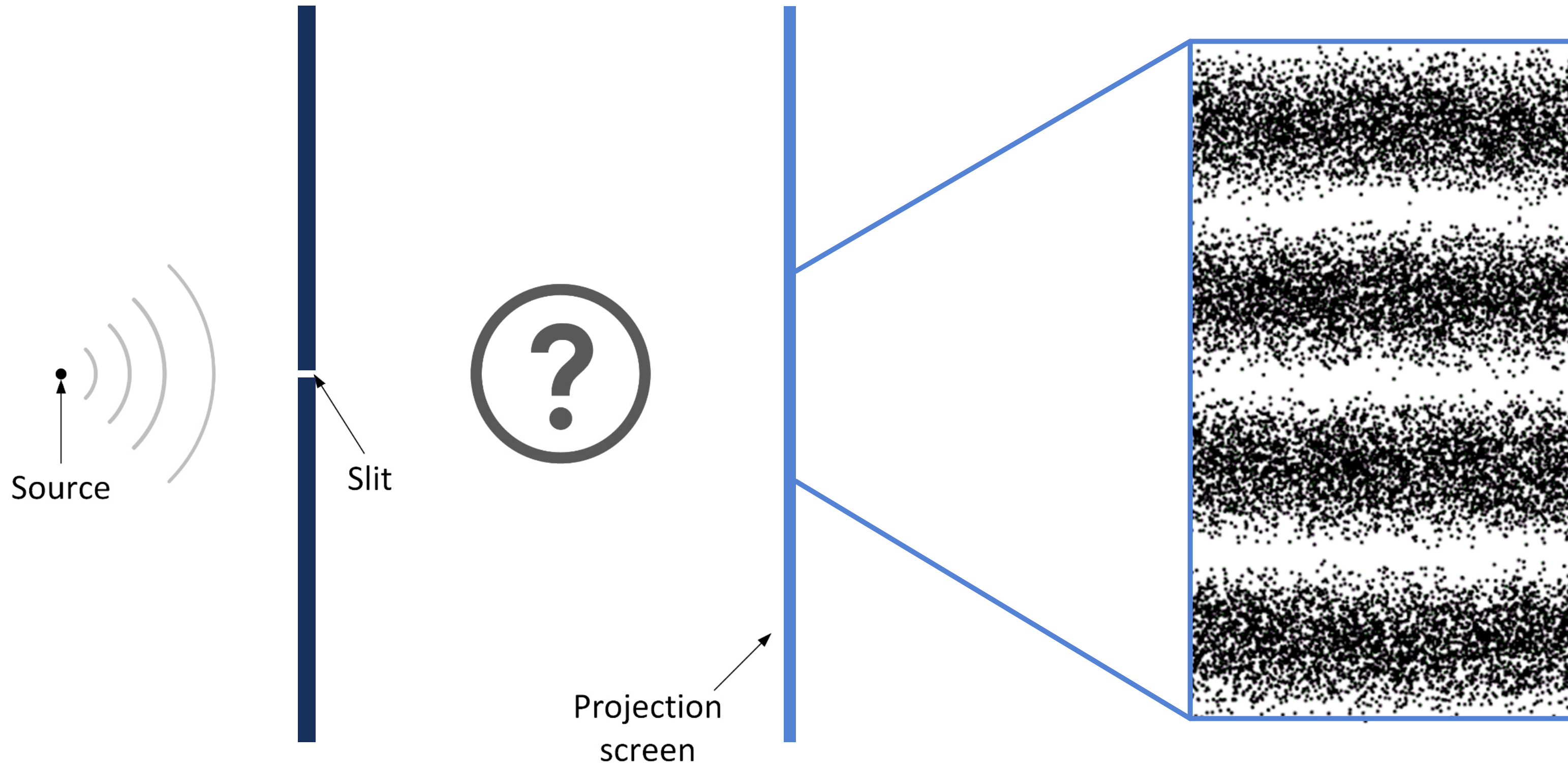
- Tutorial 3: Young's Slit Experiments
  - Single slit
    - Theory
    - Simulation
  - Double slit
    - Theory
    - Simulation

# Young's Slit Experiment: Single Slit

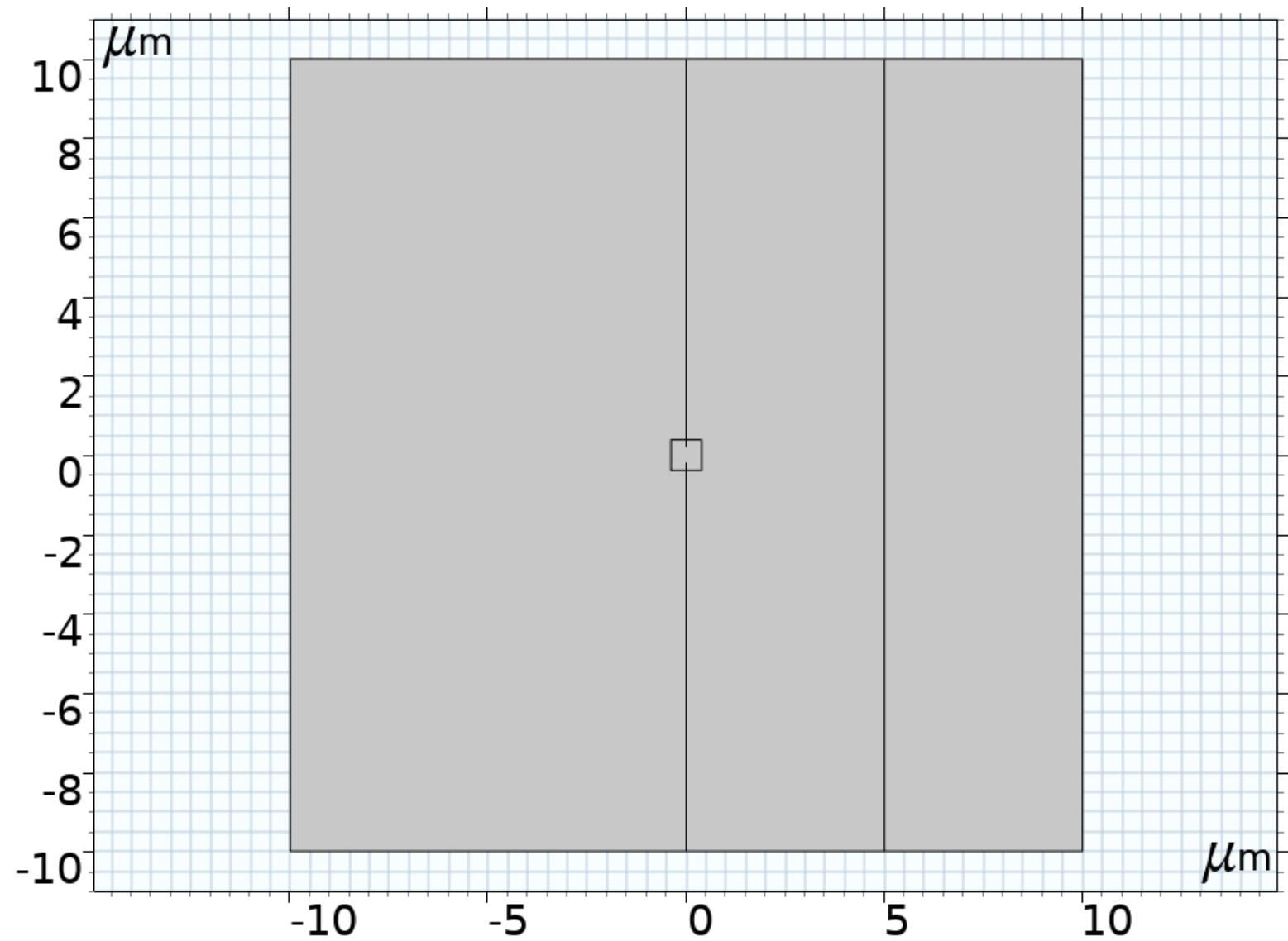




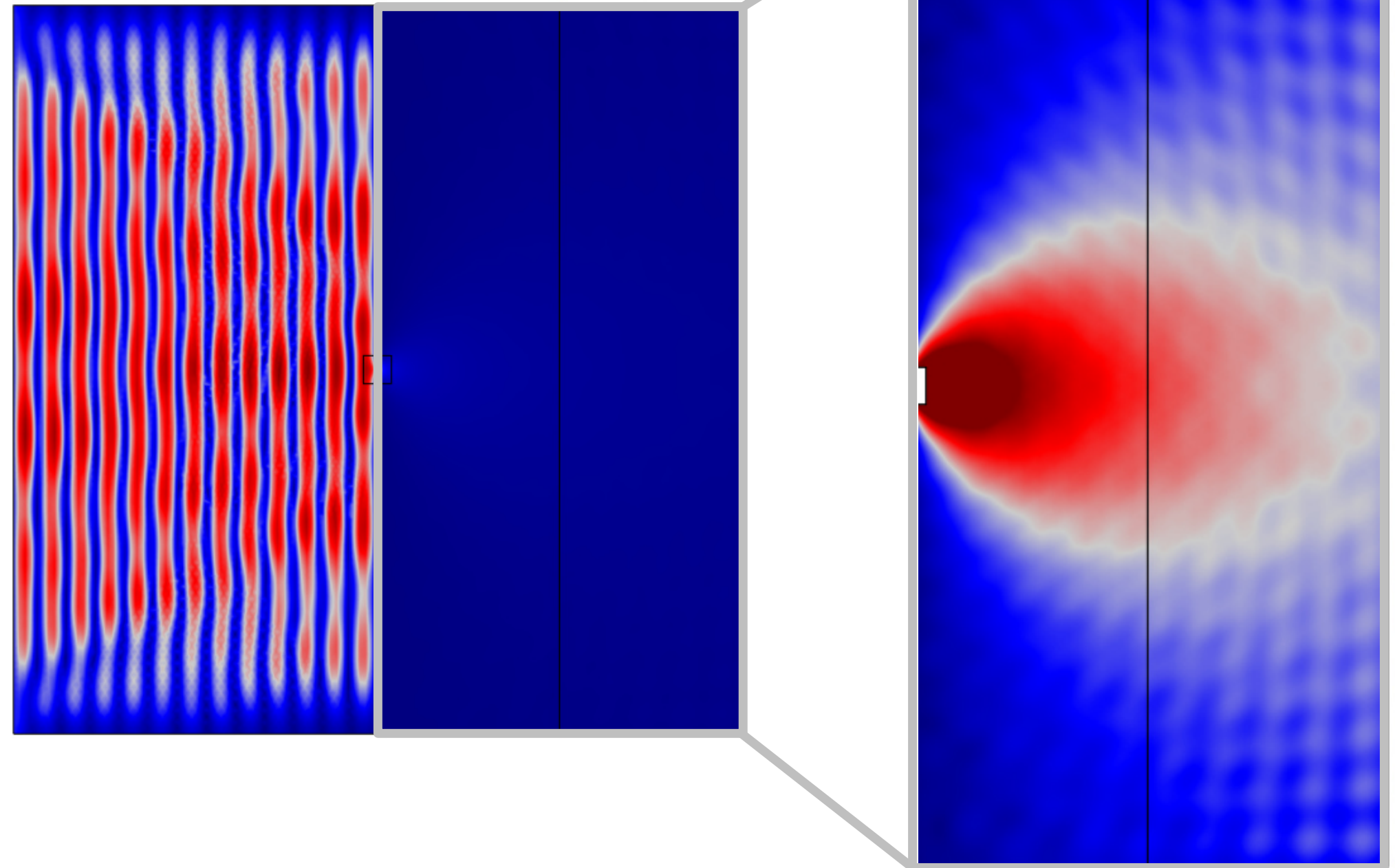
# Young's Slit Experiment: Single Slit



# Single Slit Plane Wave

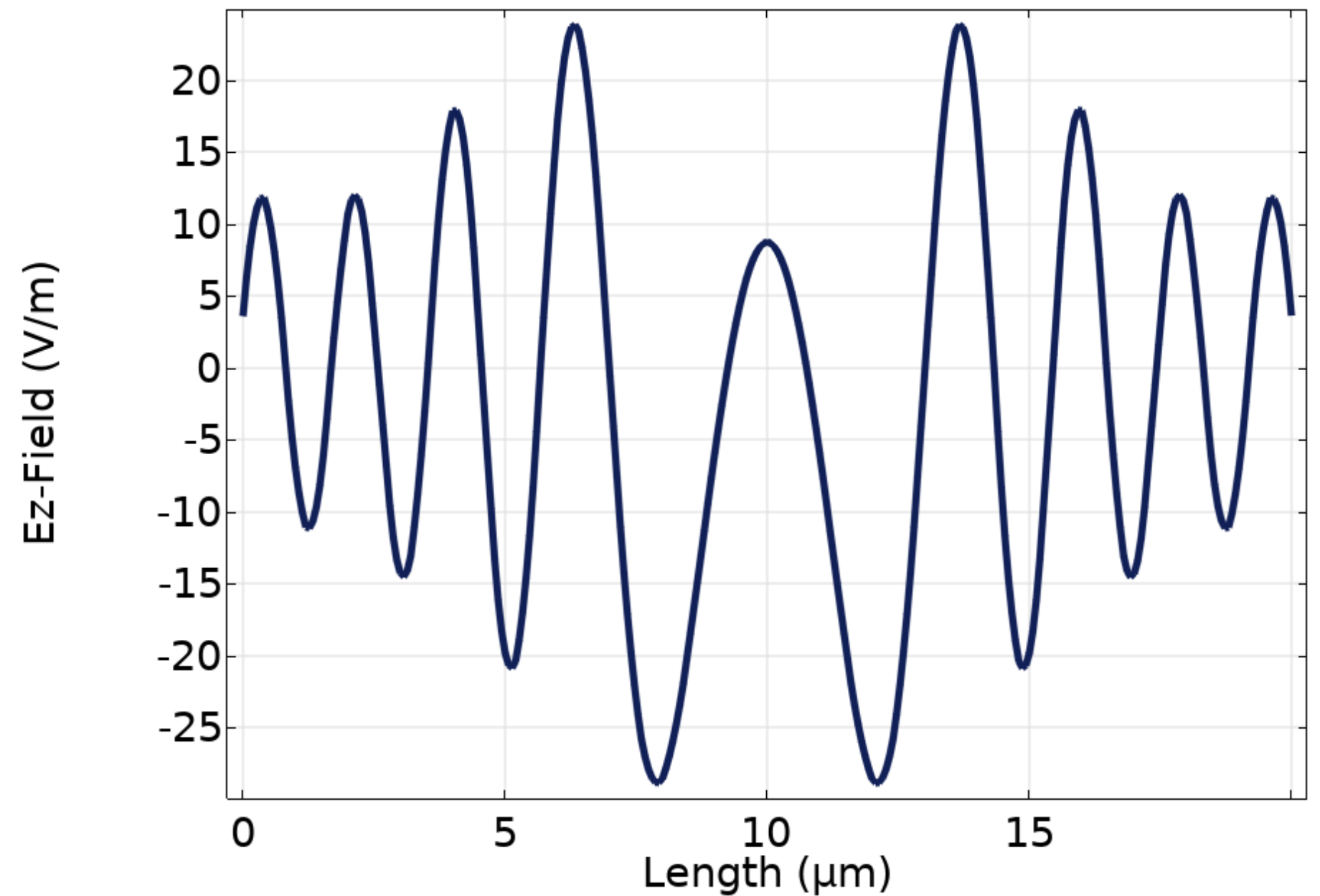
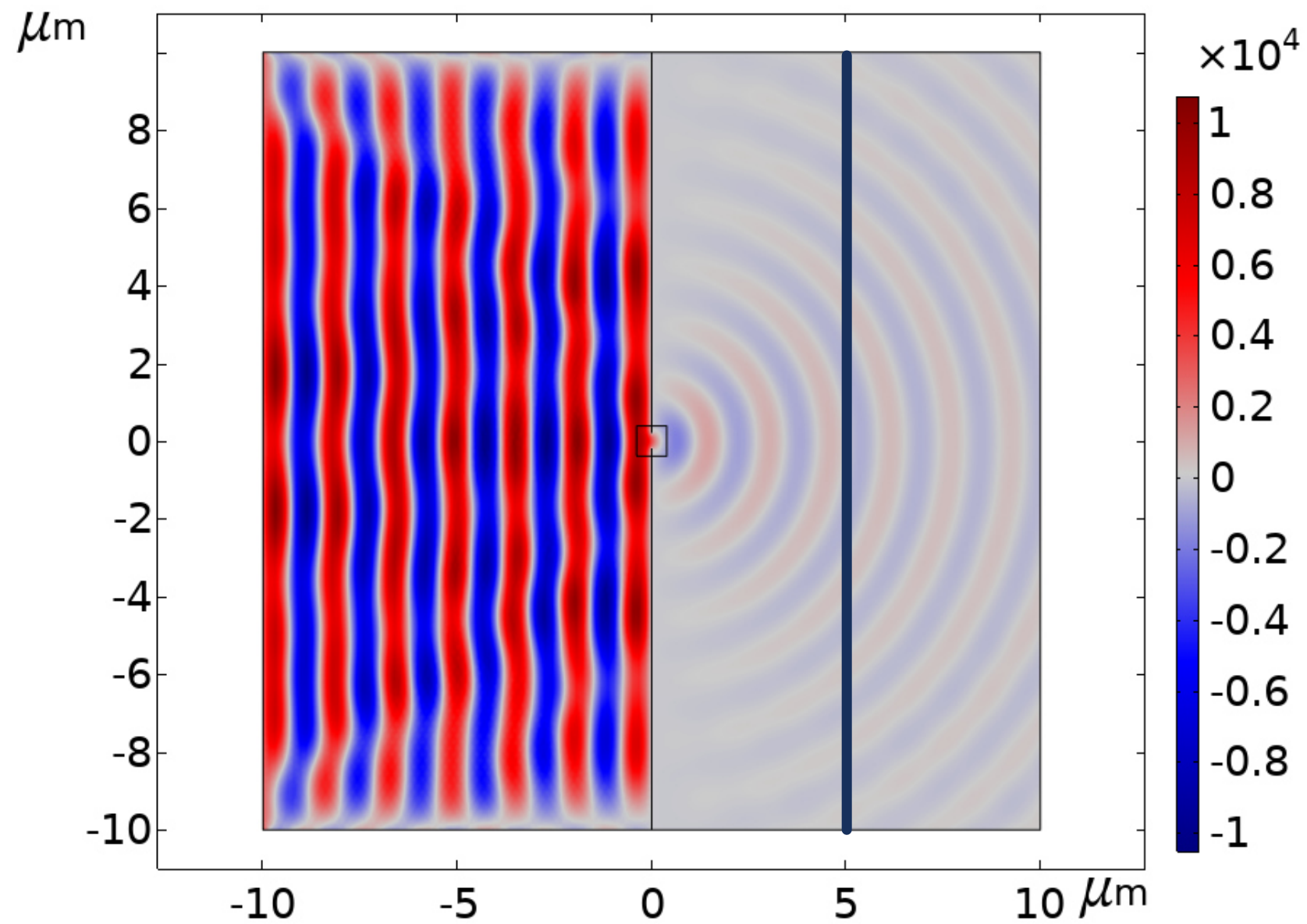


Normalized  $E$ -Field



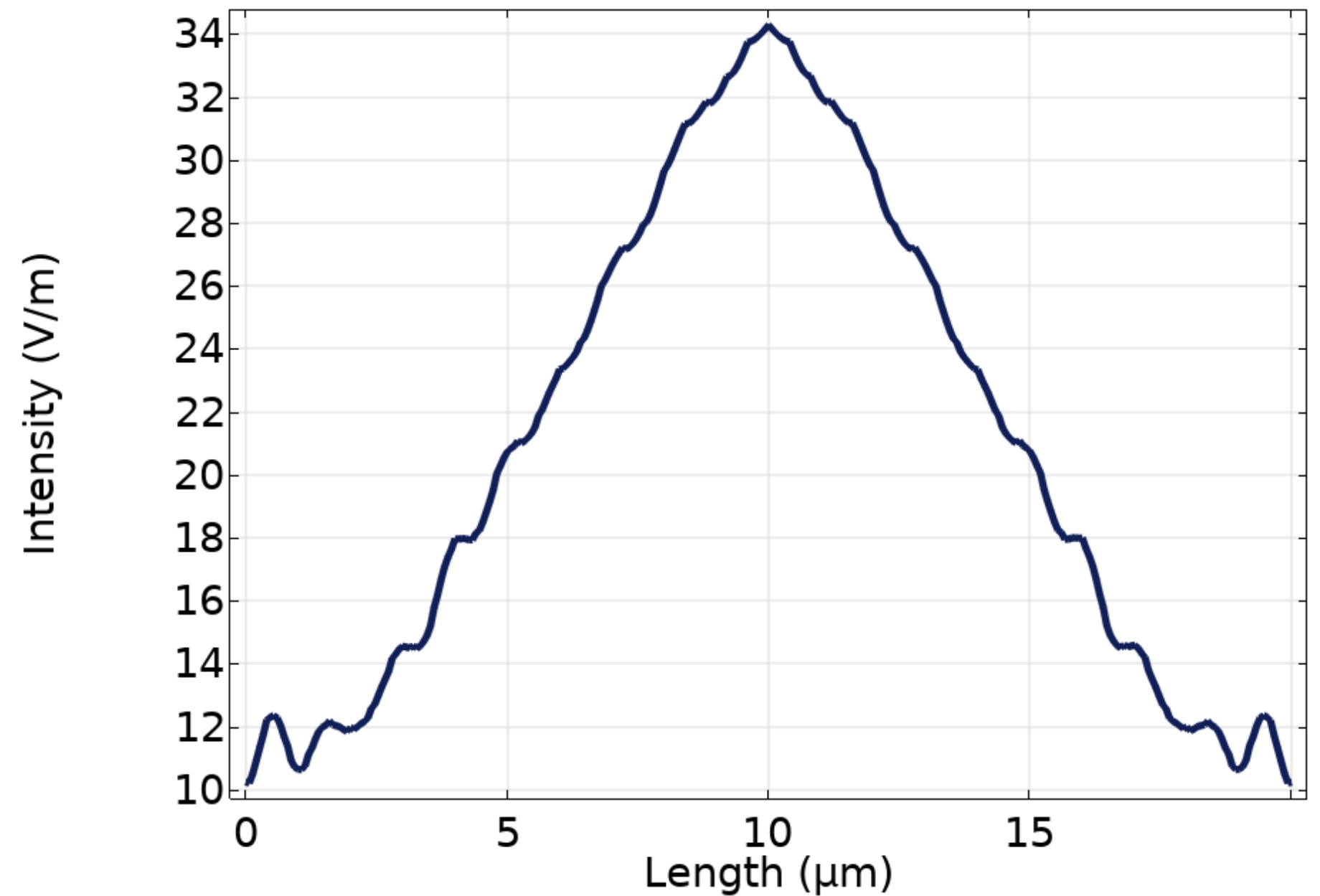
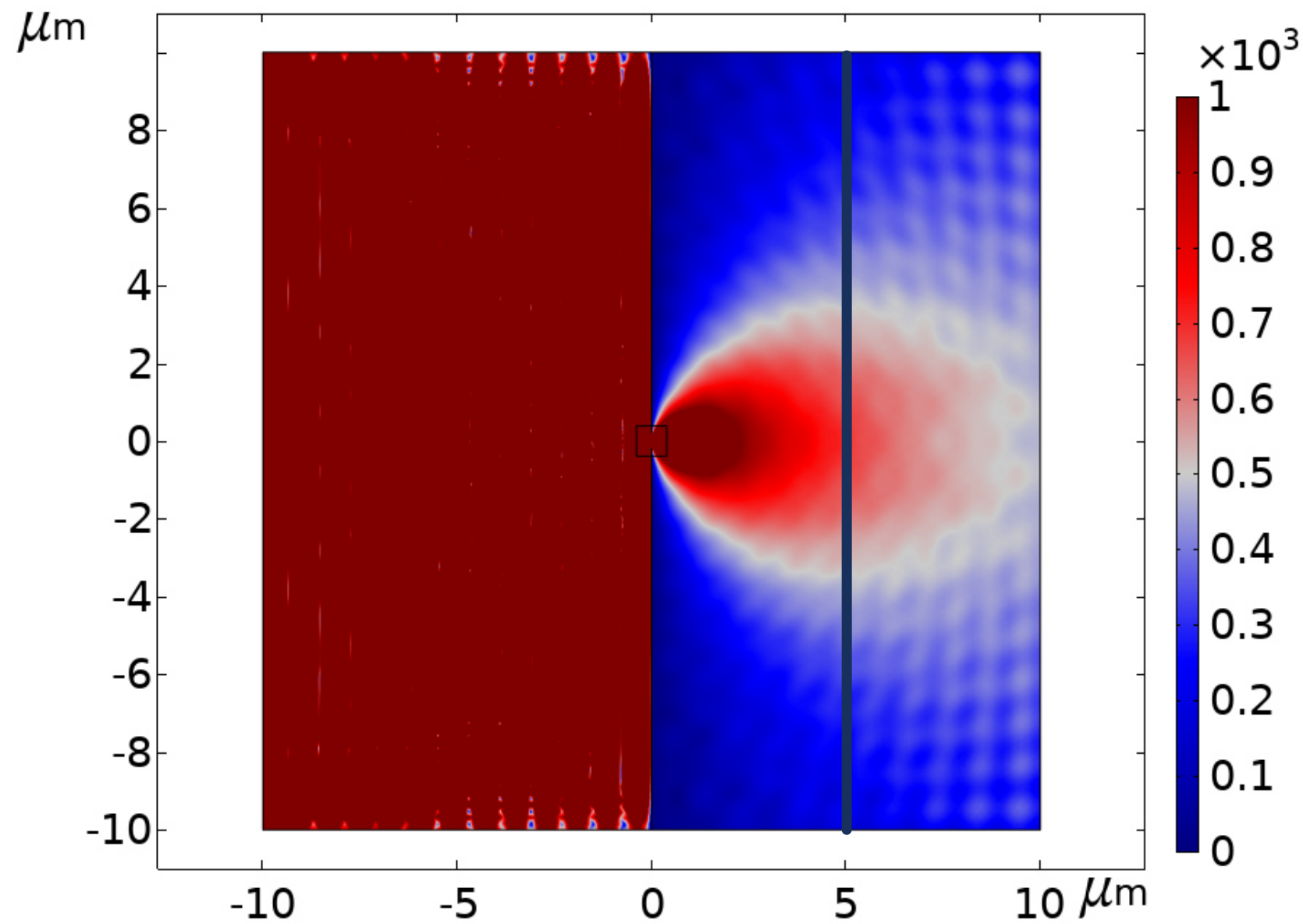


# Single Slit Plane Wave

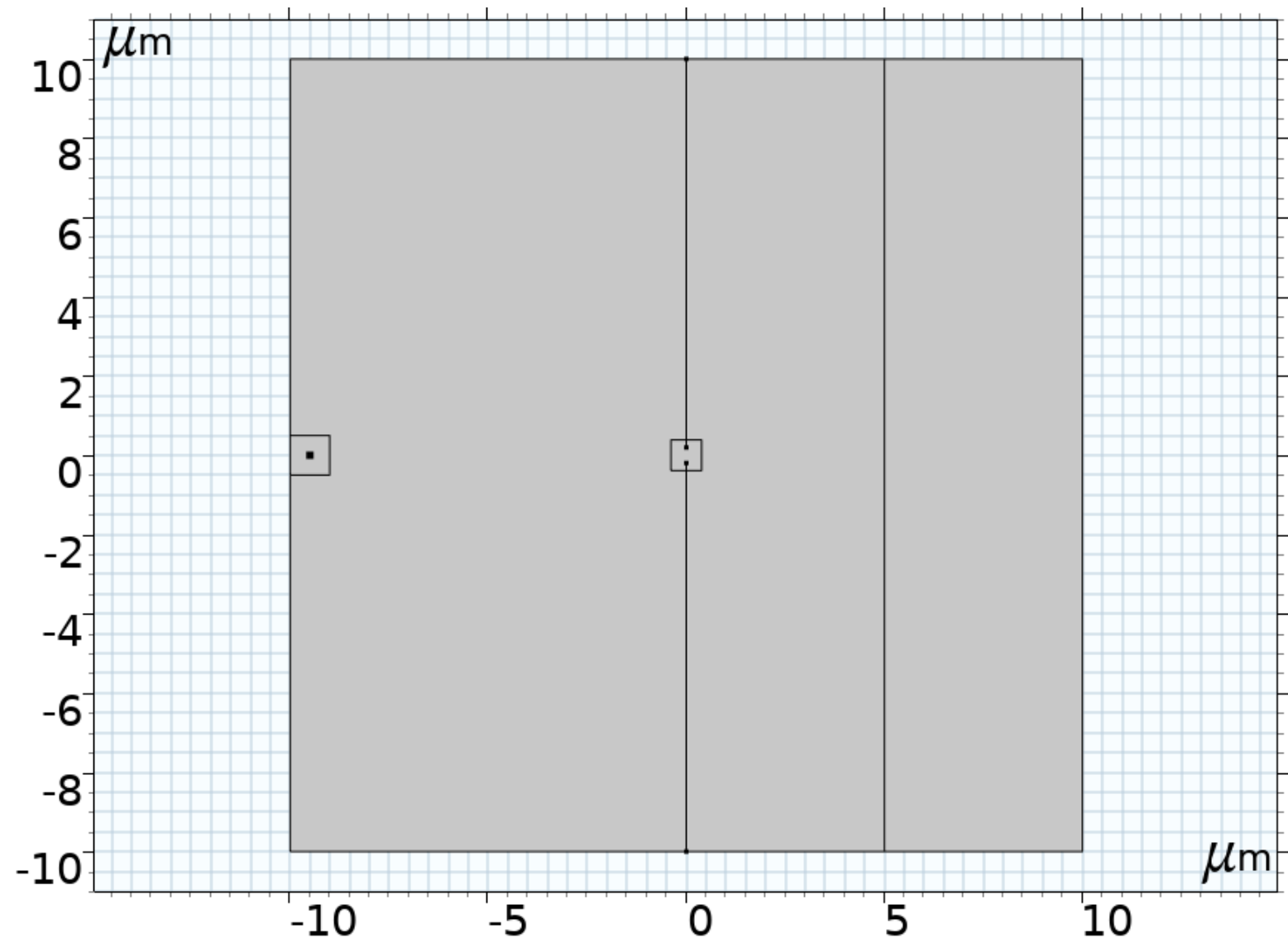
 $E_z$ -Field

# Single Slit Plane Wave

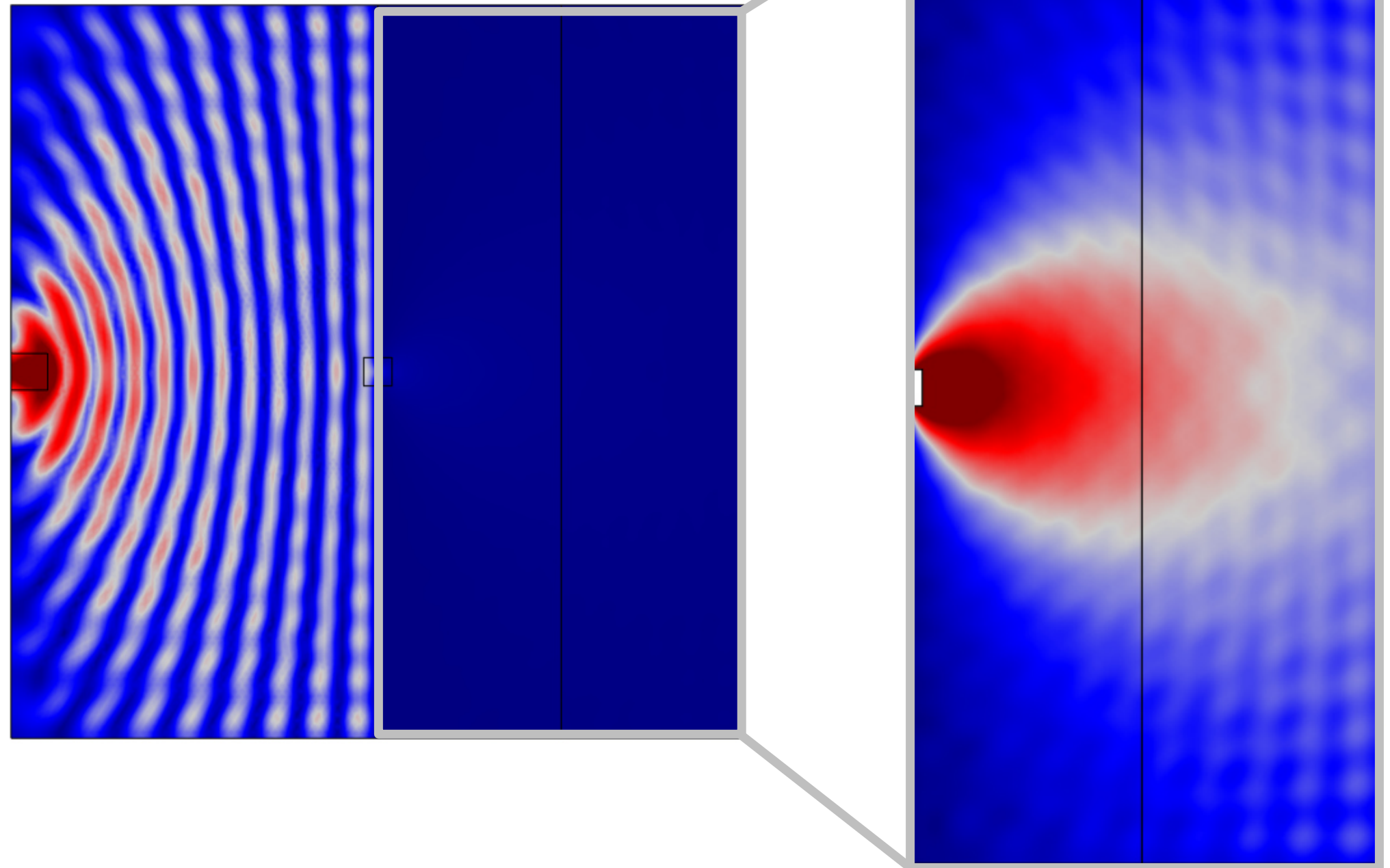
Intensity:  $\sqrt{|E_z|^2}$



# Single Slit Point Source

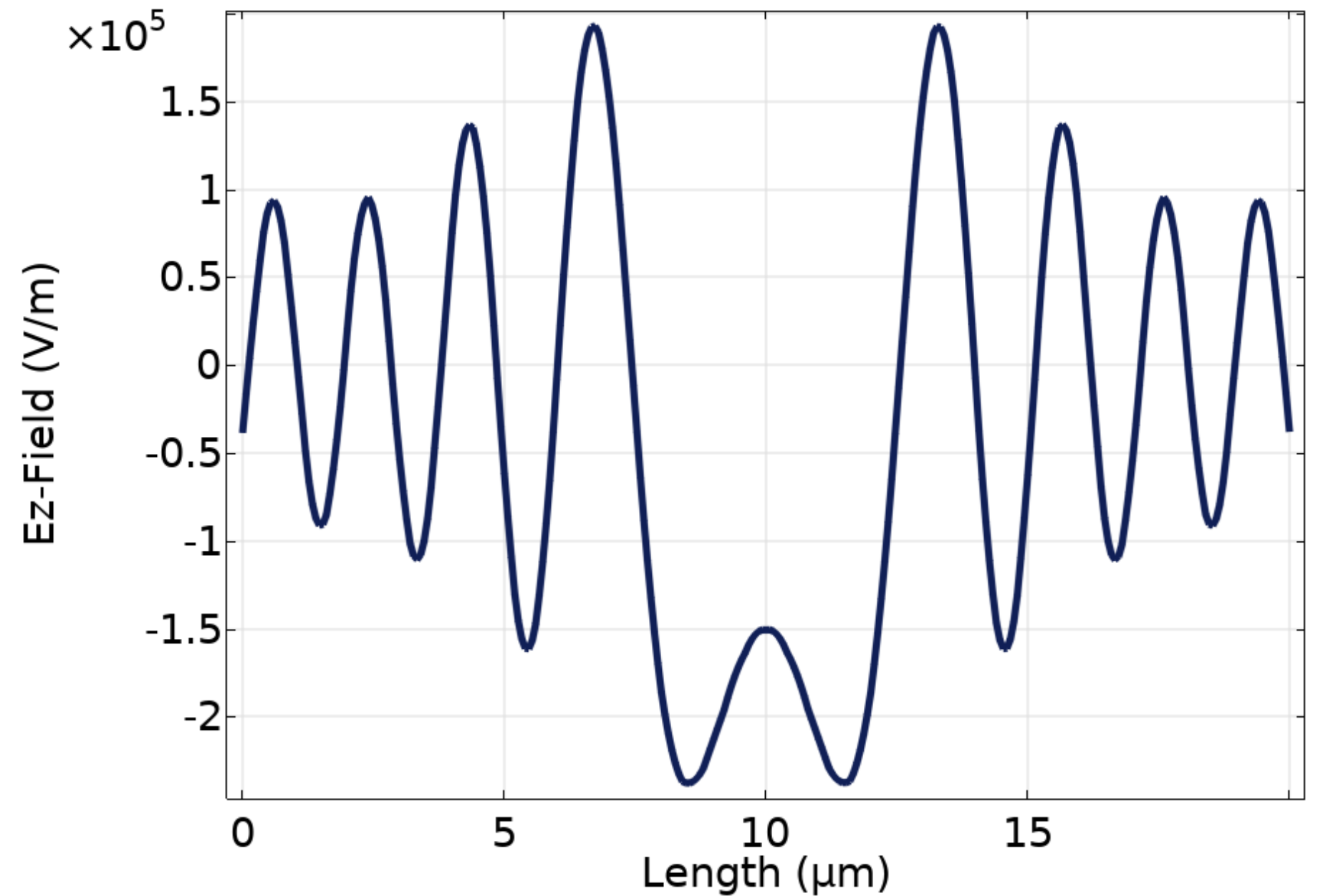
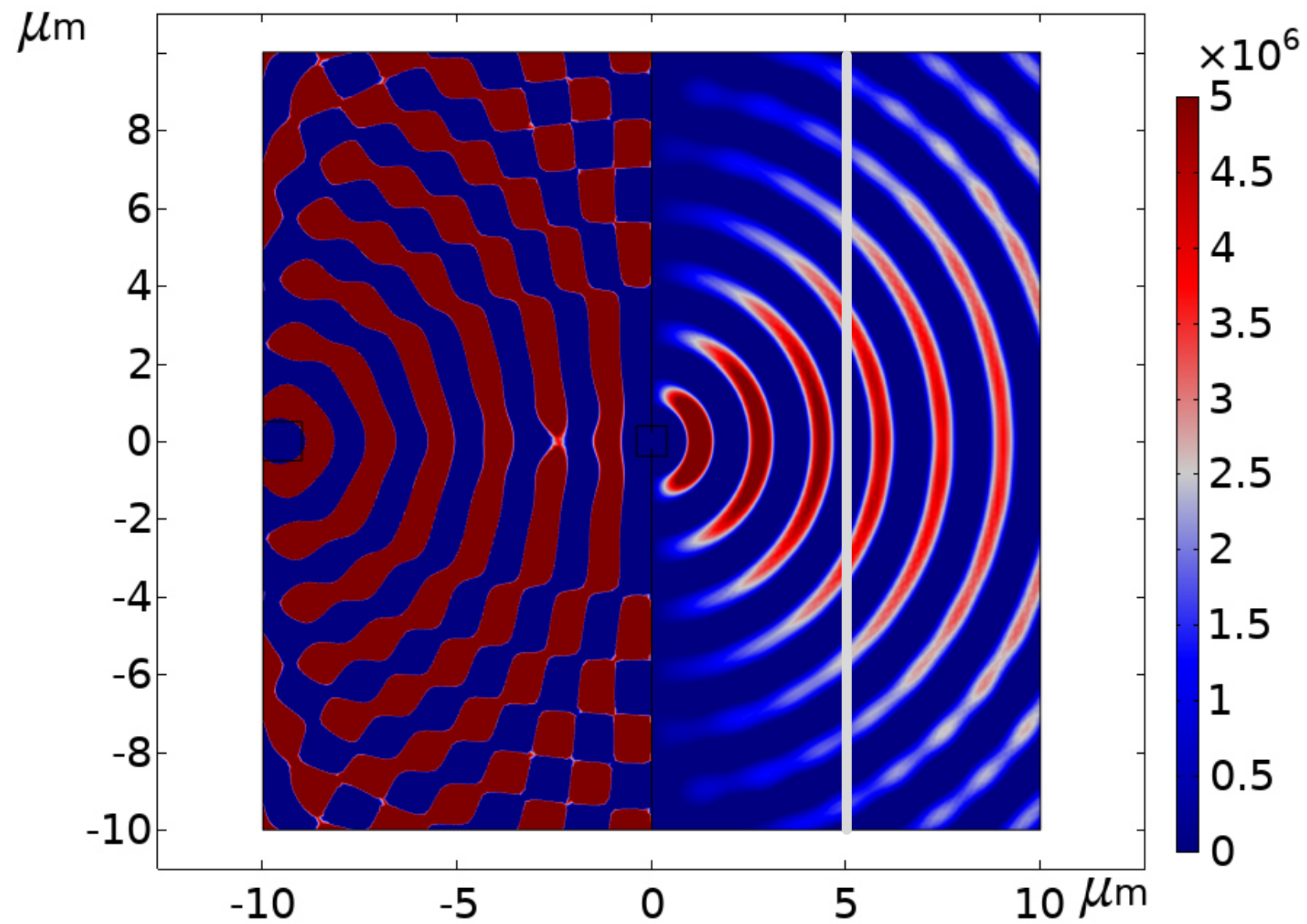


Normalized  $E$ -Field



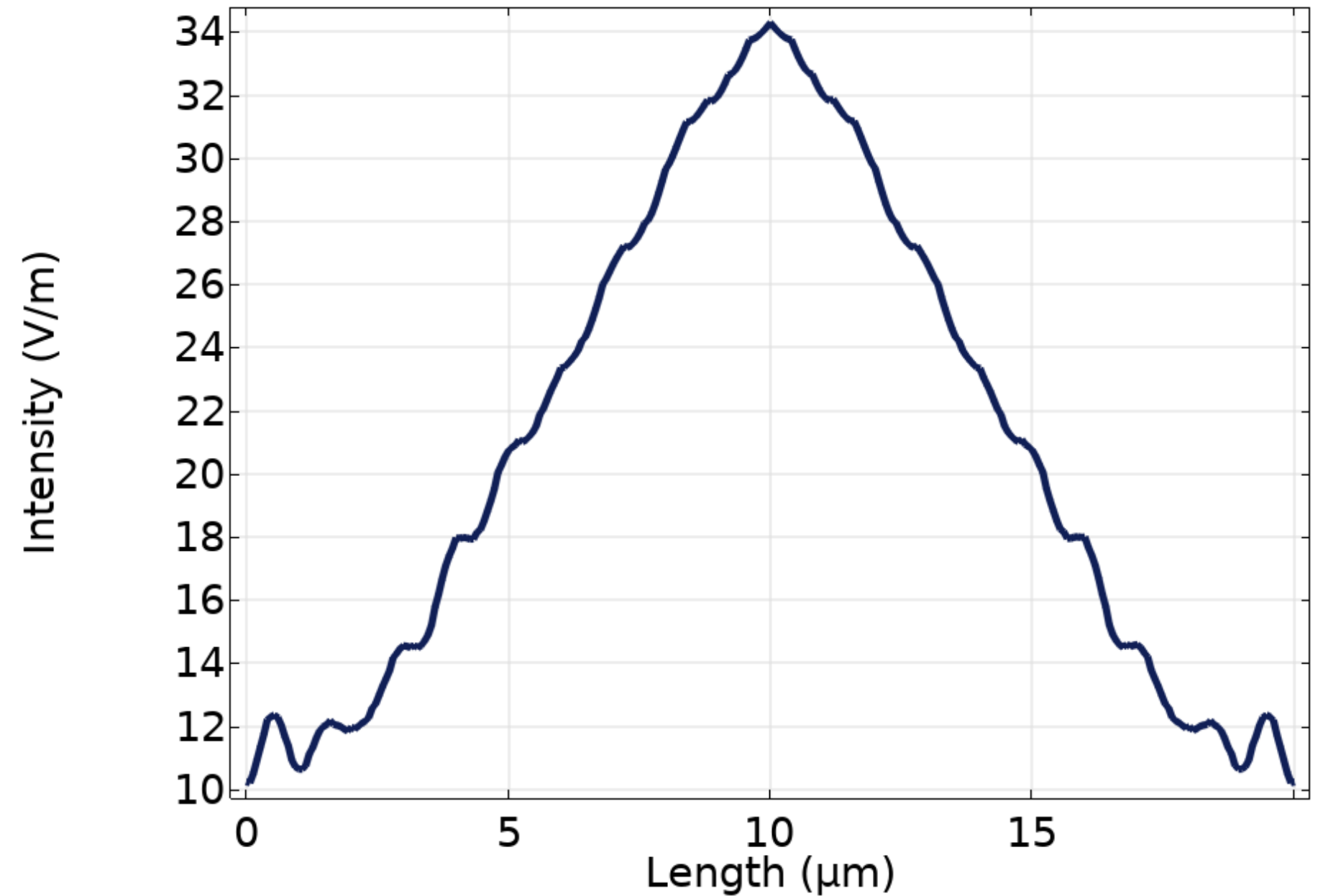
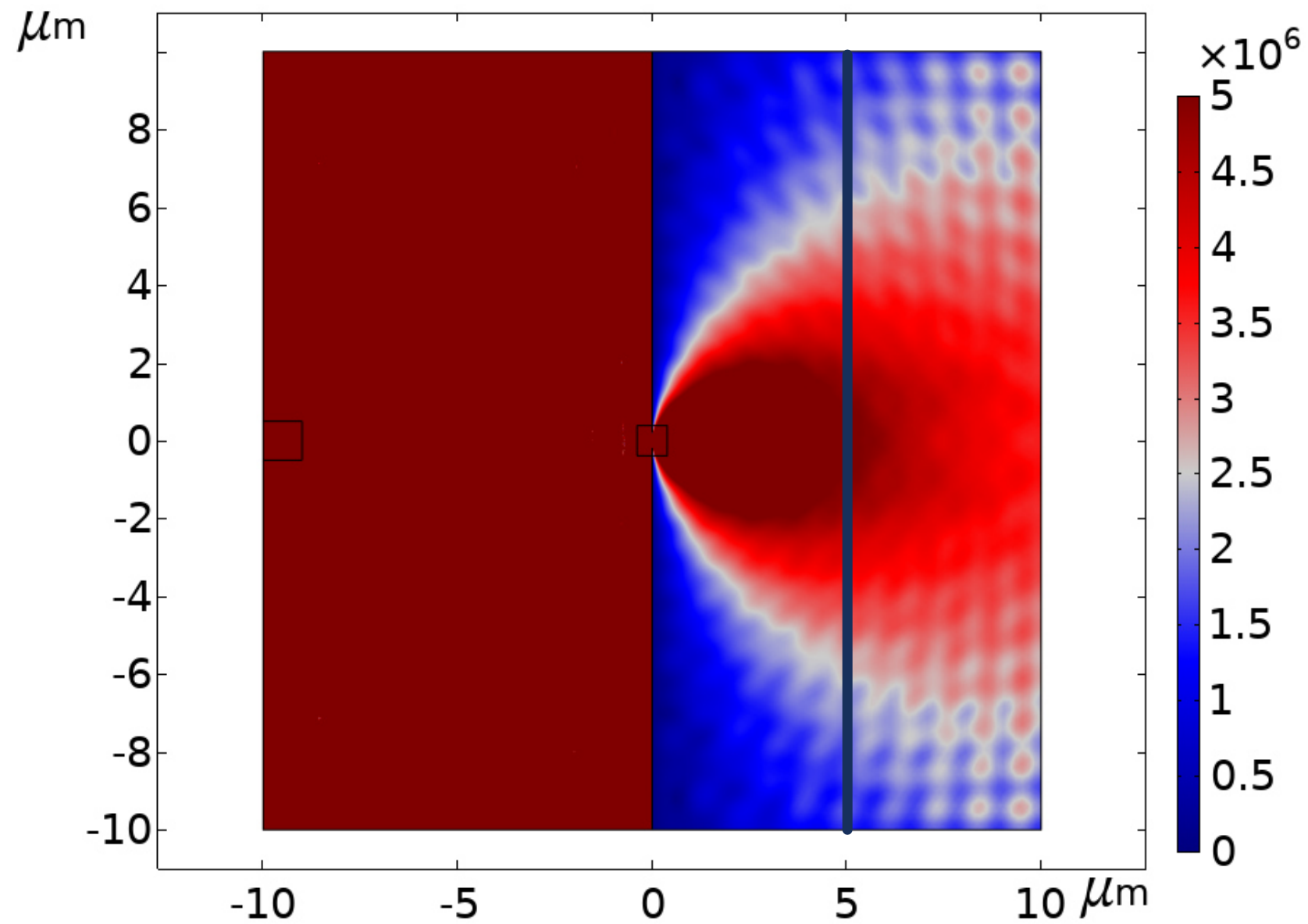


# Single Slit Plane Wave

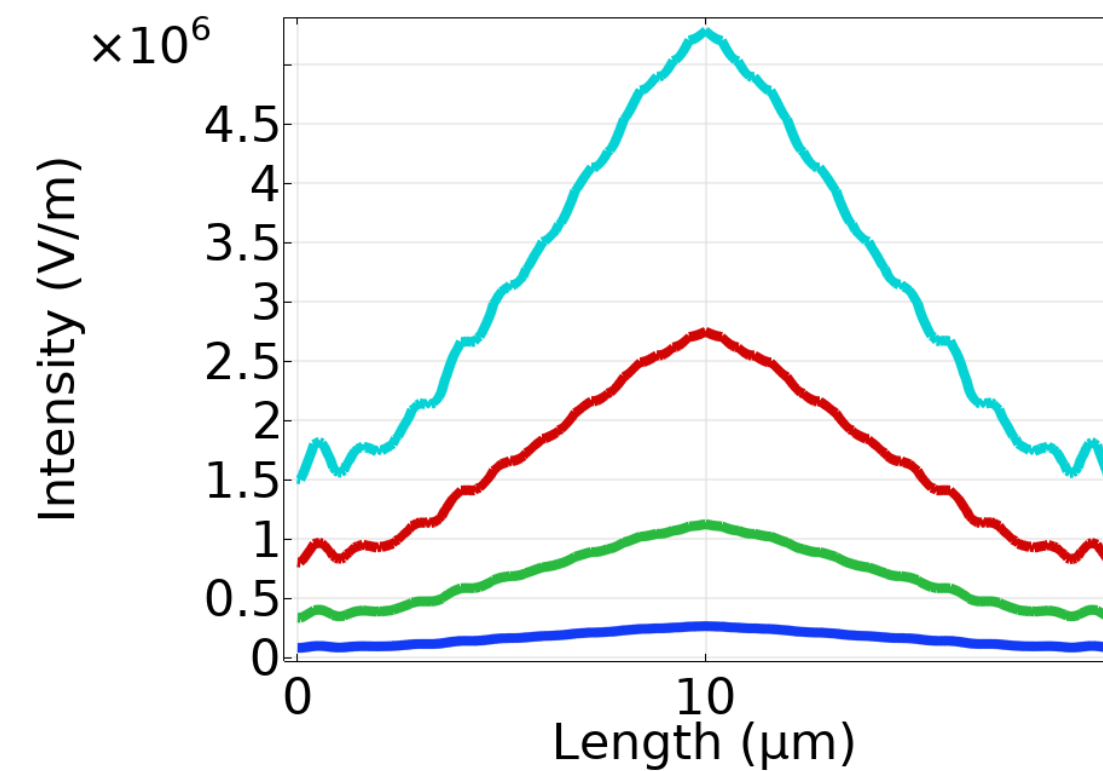
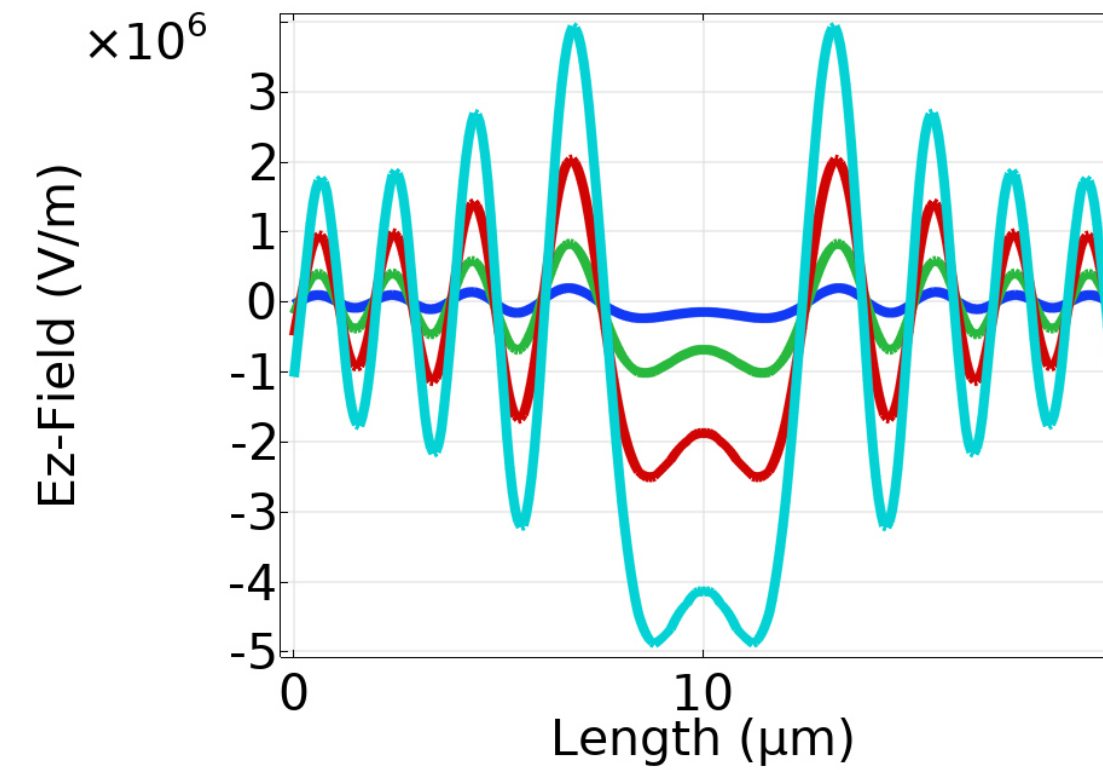
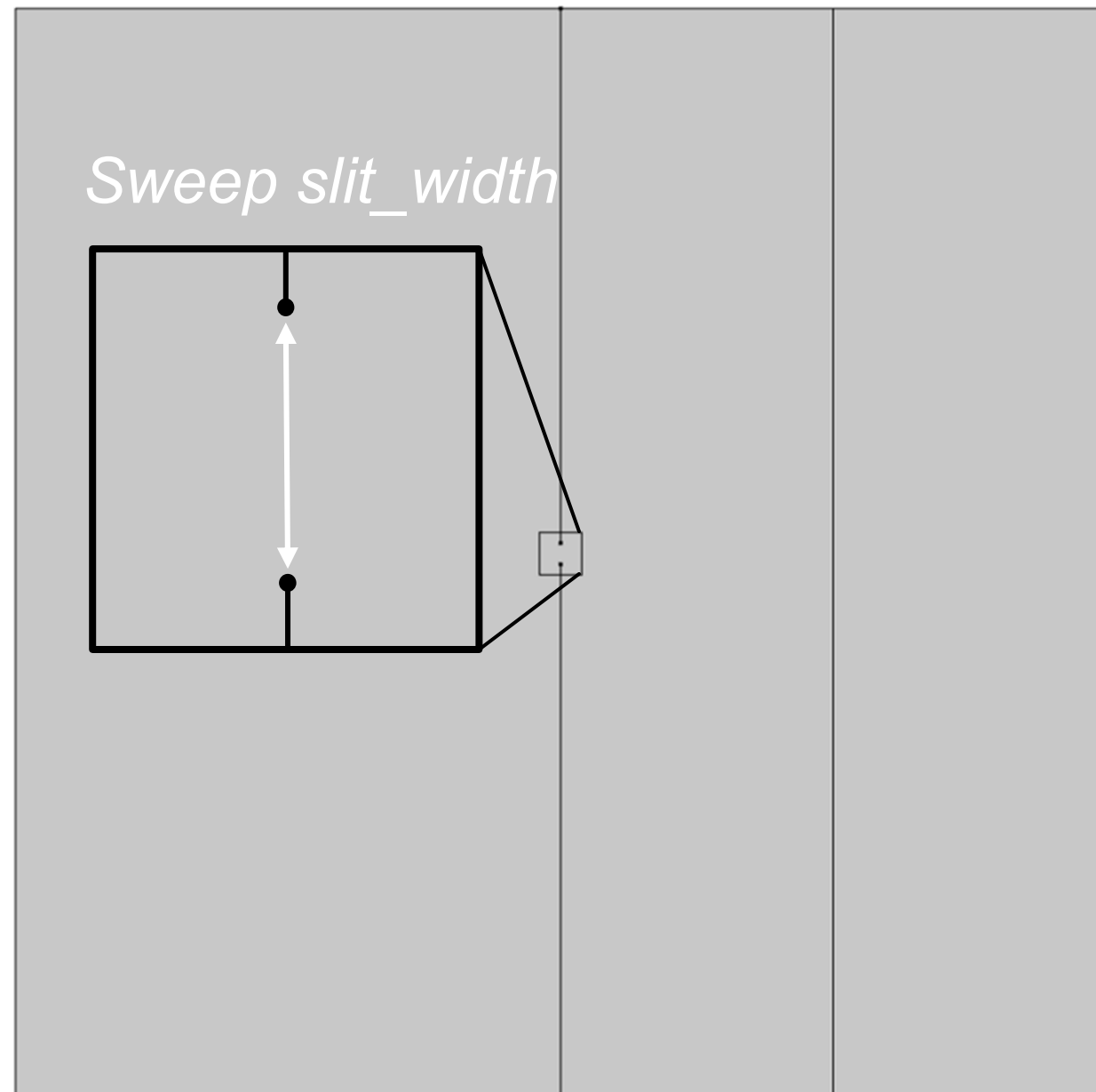
 $E_z$ -Field

# Single Slit Plane Wave

Intensity:  $\sqrt{|E_z|^2}$



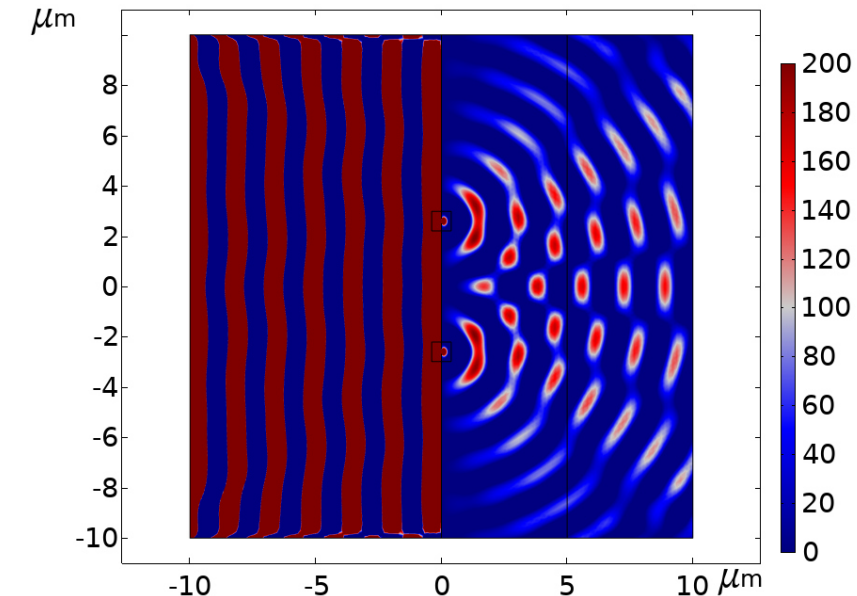
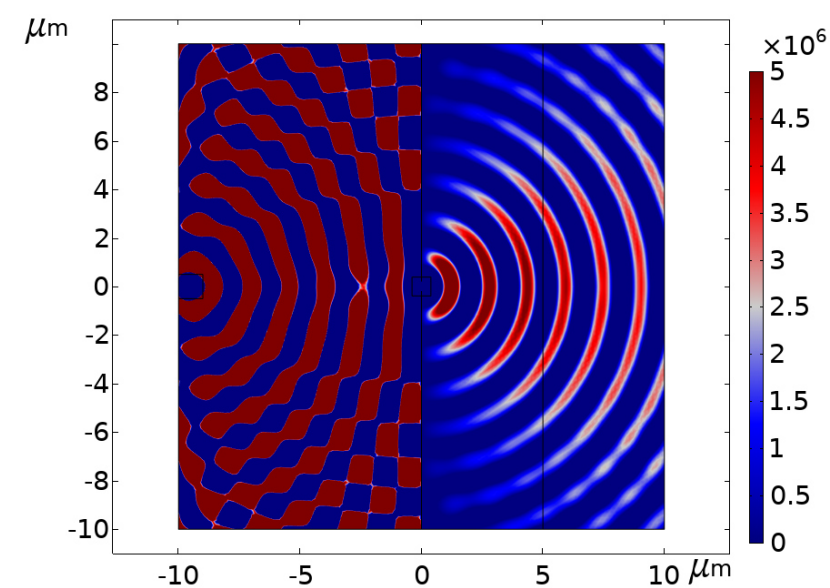
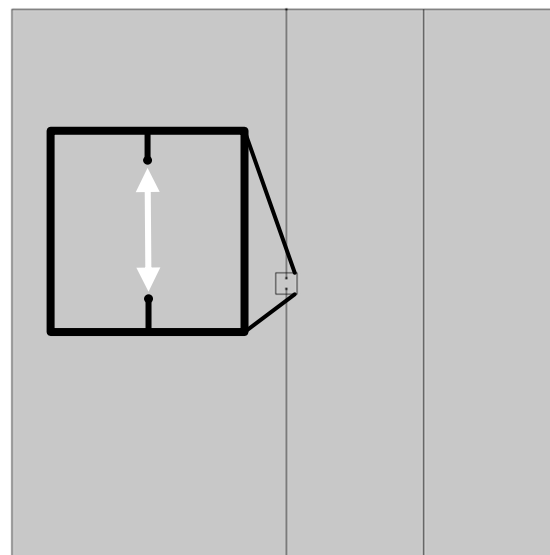
# Young's Slit Experiment: Single Slit – Parametric Sweep Results





# Single Slit Plane Wave

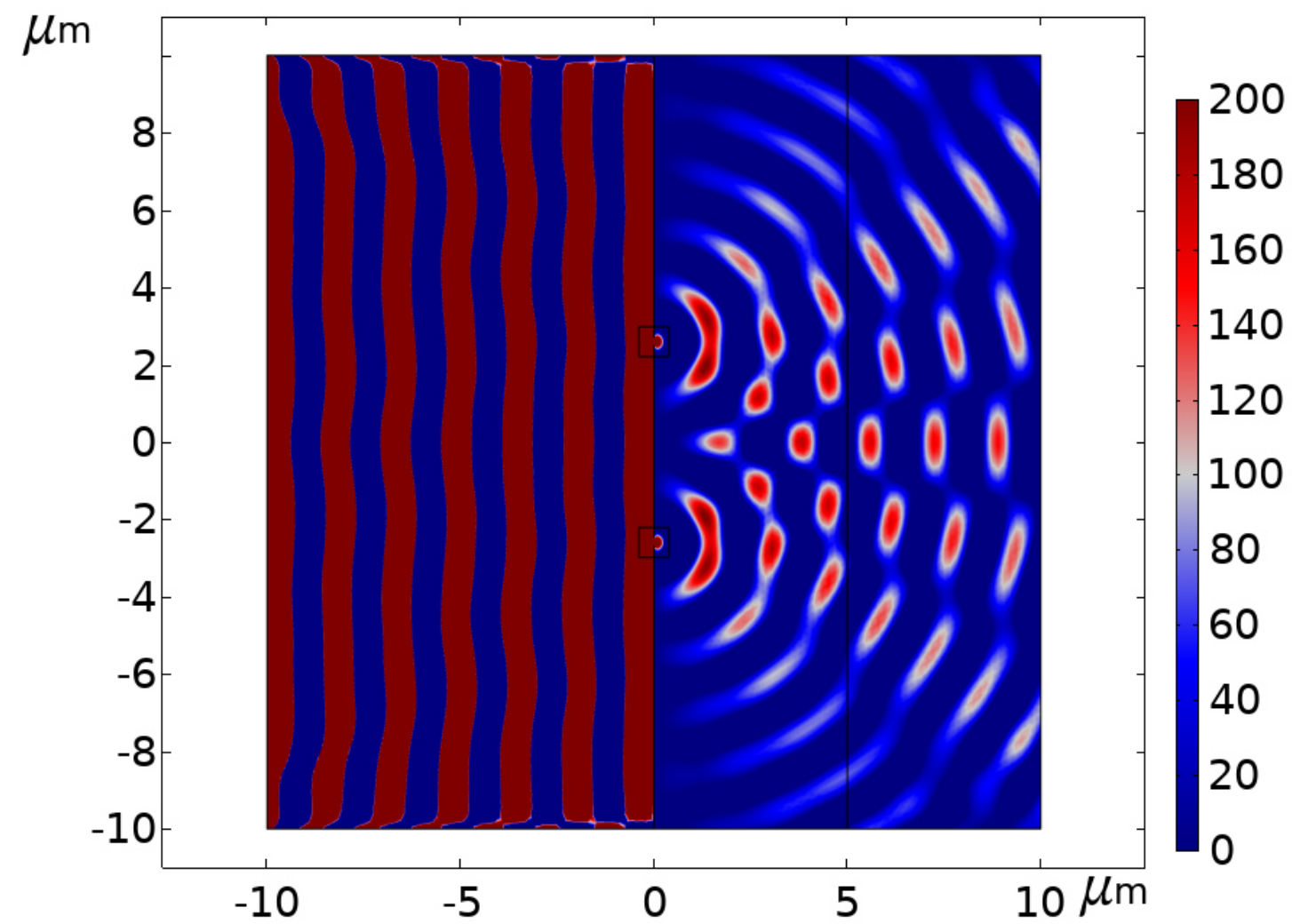
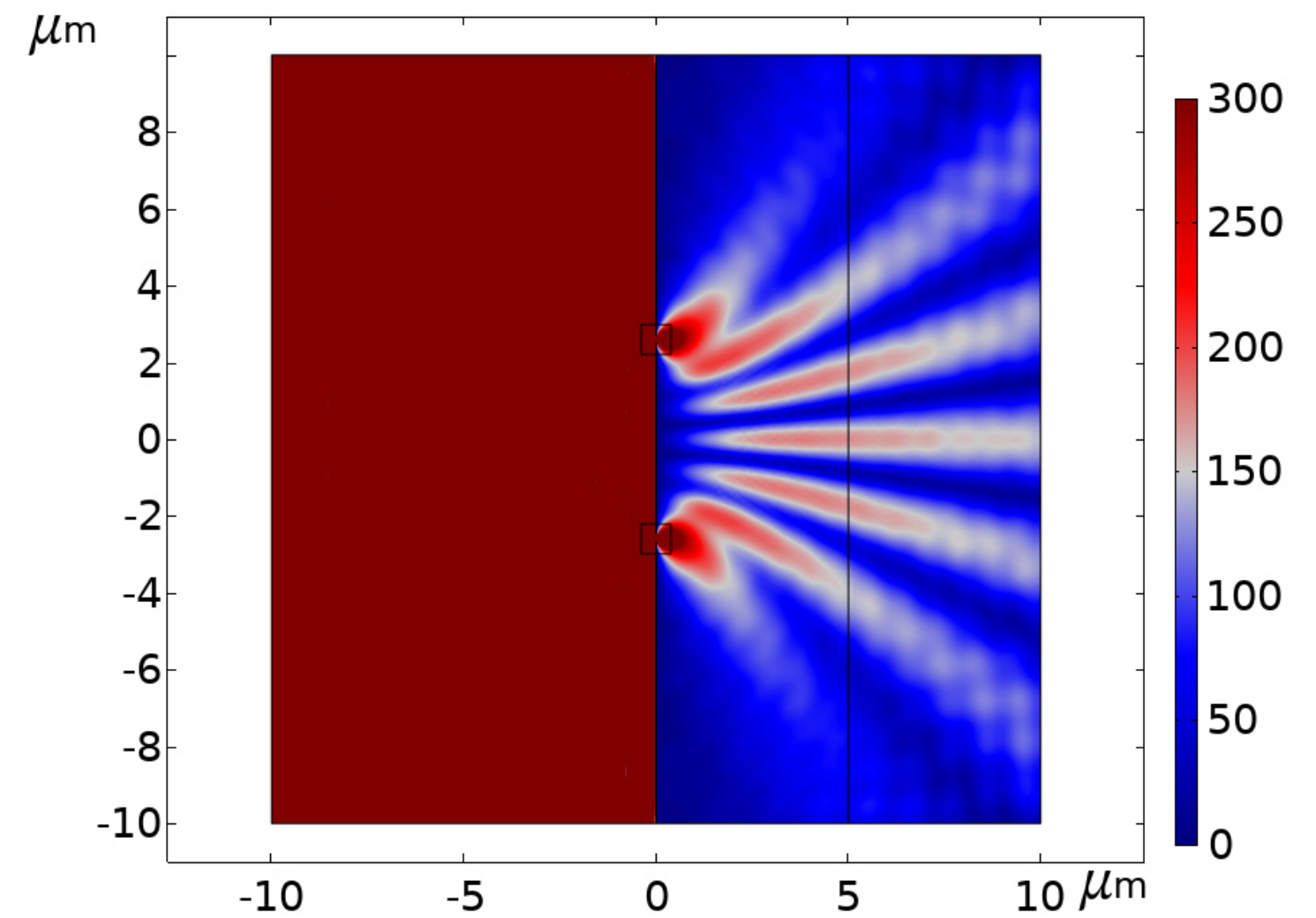
domain_x	20[um]	2E-5 m	length domain
domain_y	20[um]	2E-5 m	width domain
lam0	1550[nm]	1.55E-6 m	wavelength
f0	c_const/lam0	1.9341E14 1/s	frequency
slit_width	lam0/4	3.875E-7 m	slit width
sep	5[um]	5E-6 m	seperation
screen	5[um]	5E-6 m	location of screen
source_x	-9.5[um]	-9.5E-6 m	location of point source
source_box	1[um]	1E-6 m	mesh refinement point source



# Young's Slit Experiment: Single Slit – Parametric Sweep Results

Let's take a look at COMSOL

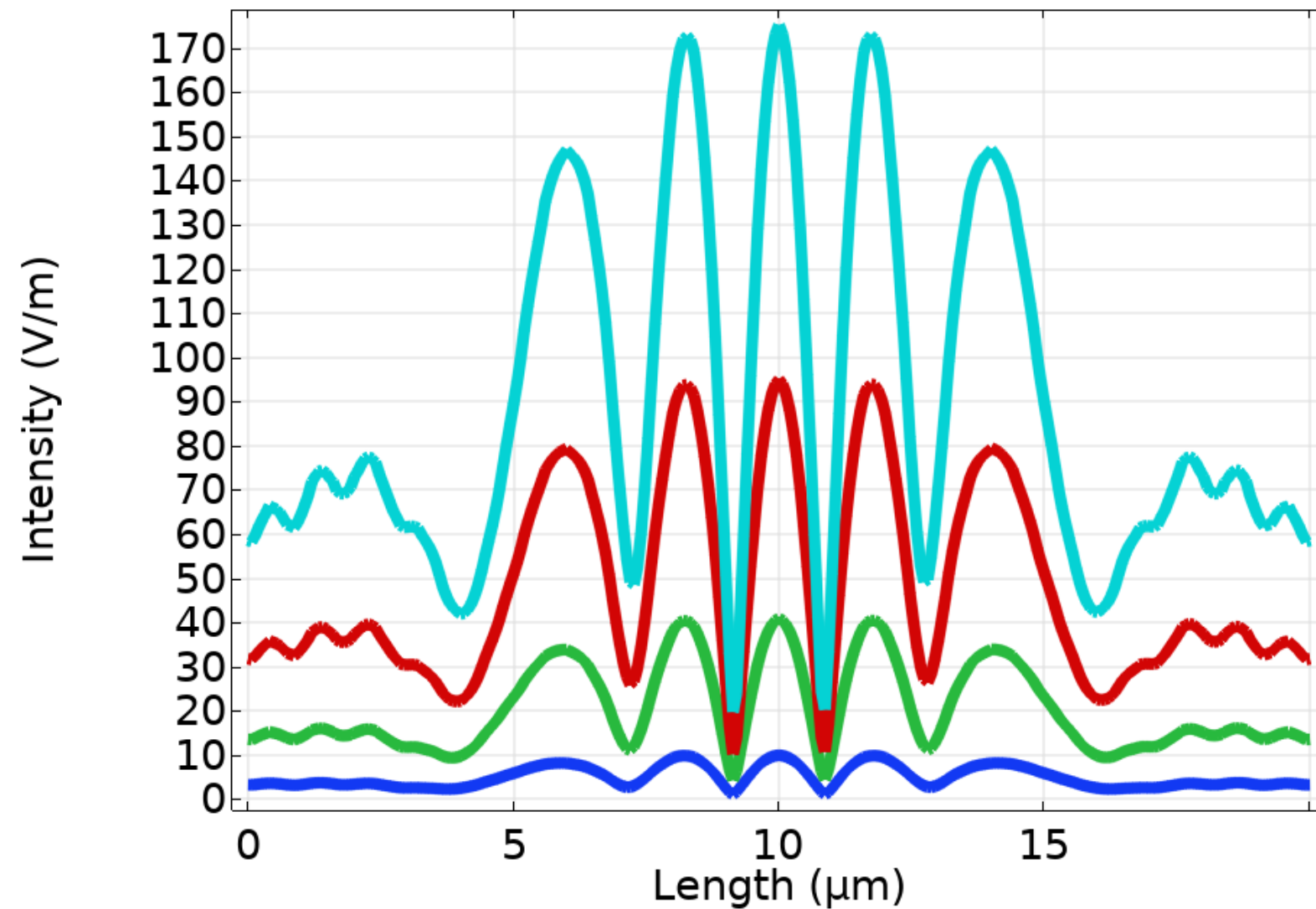
# Young's Slit Experiment: Double Slit – Theory

 $E_z$ -FieldIntensity:  $\sqrt{|E_z|^2}$ 

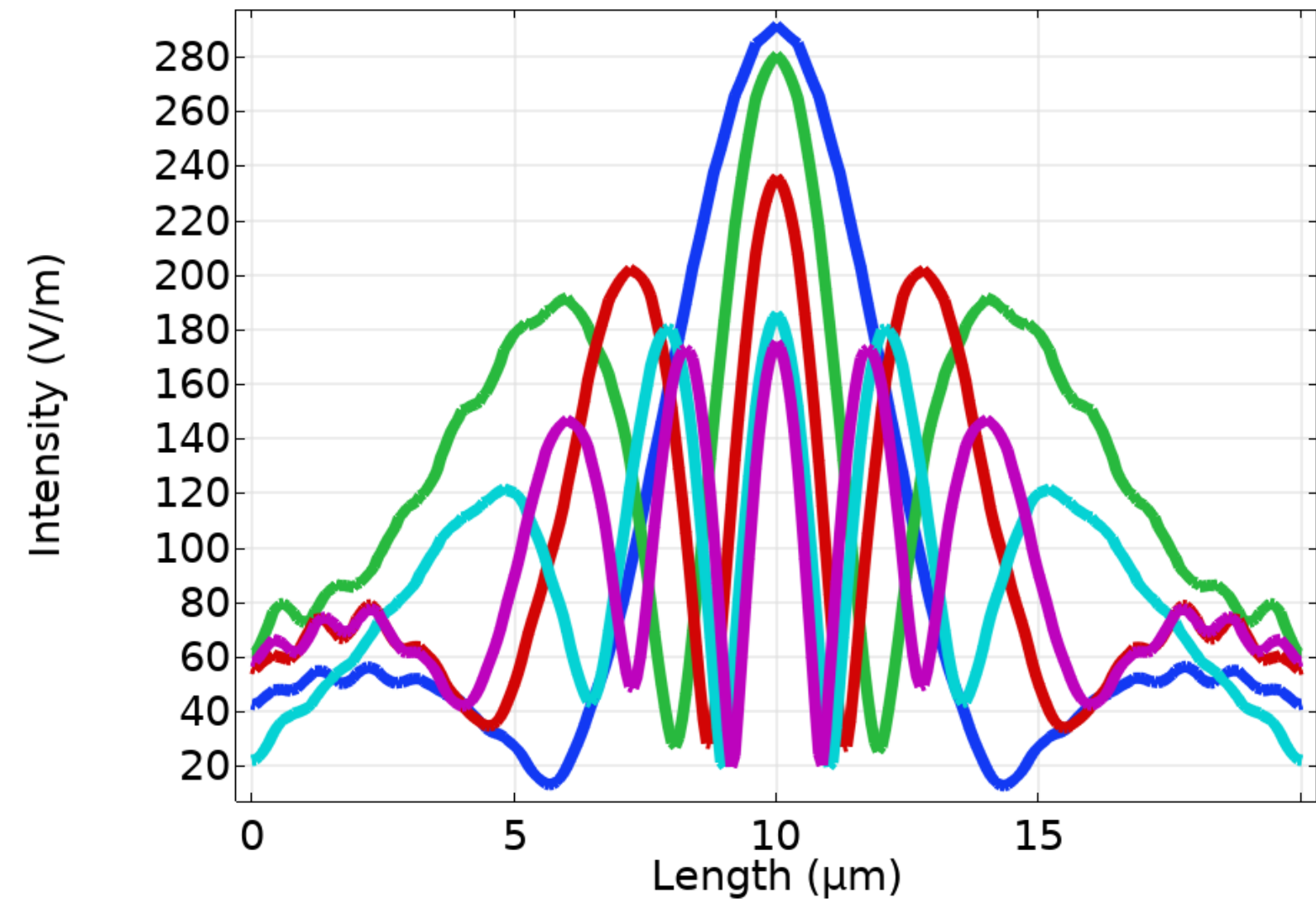


# Young's Slit Experiment: Double Slit – Theory

Gapsweep  $\left(\frac{\lambda m_0}{16} \rightarrow \frac{\lambda m_0}{4}\right)$ , step:  $\left(\frac{\lambda m_0}{16}\right)$

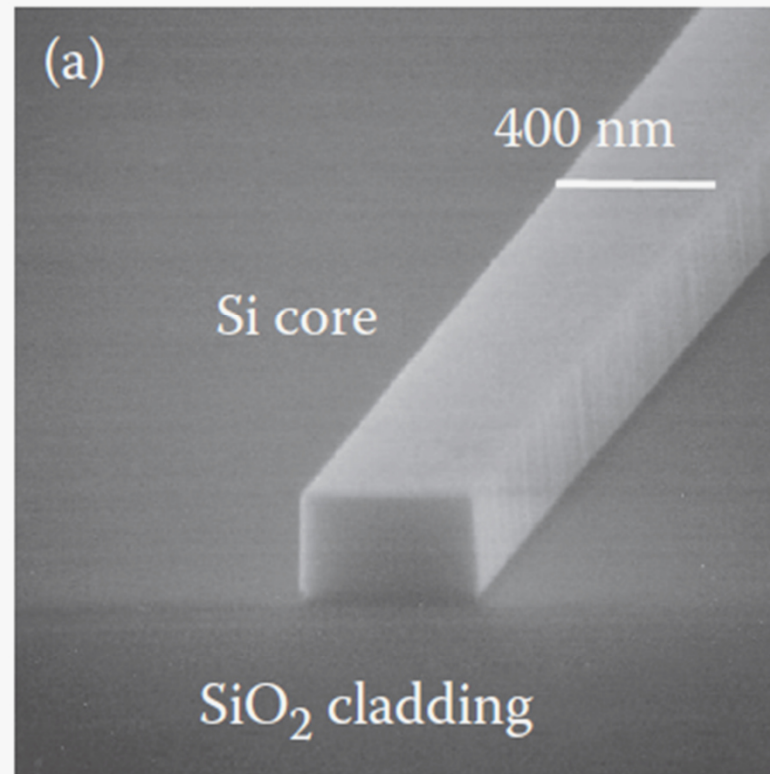


Separation Sweep  $1 \rightarrow 5 \mu\text{m}$ , step:  $1 \mu\text{m}$

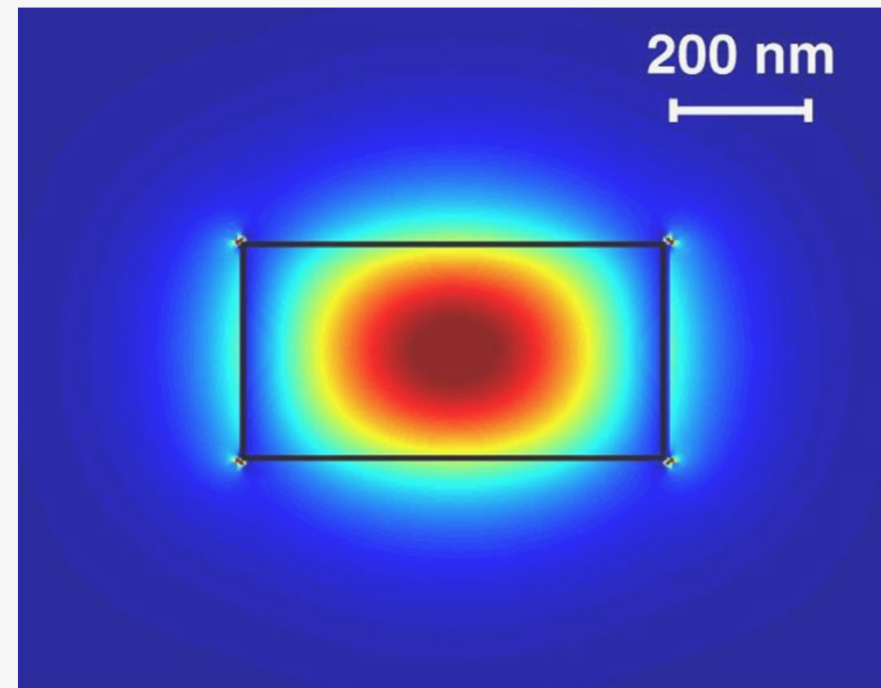


# Next Week

## Photonic Waveguide



## Mode Analysis



## Photonic Integrated Circuits

