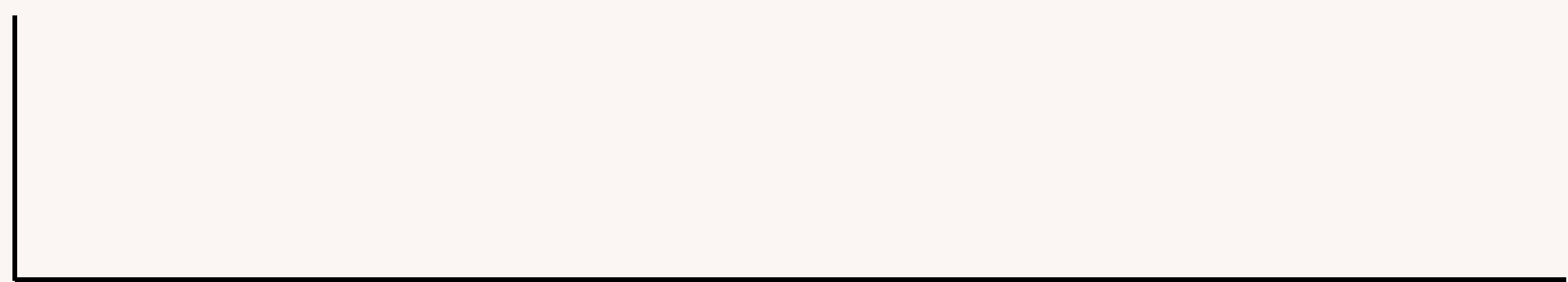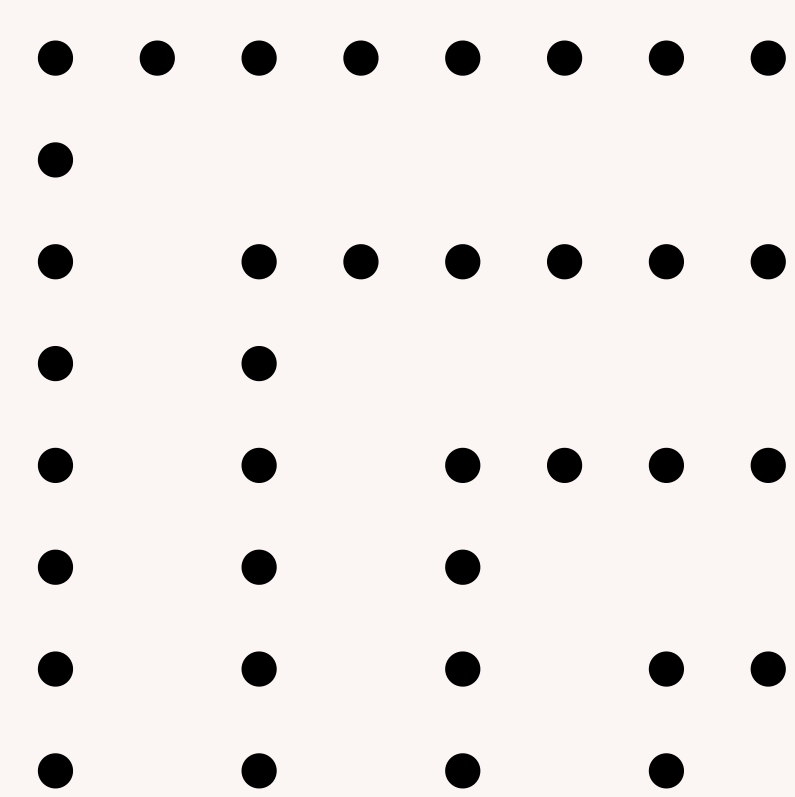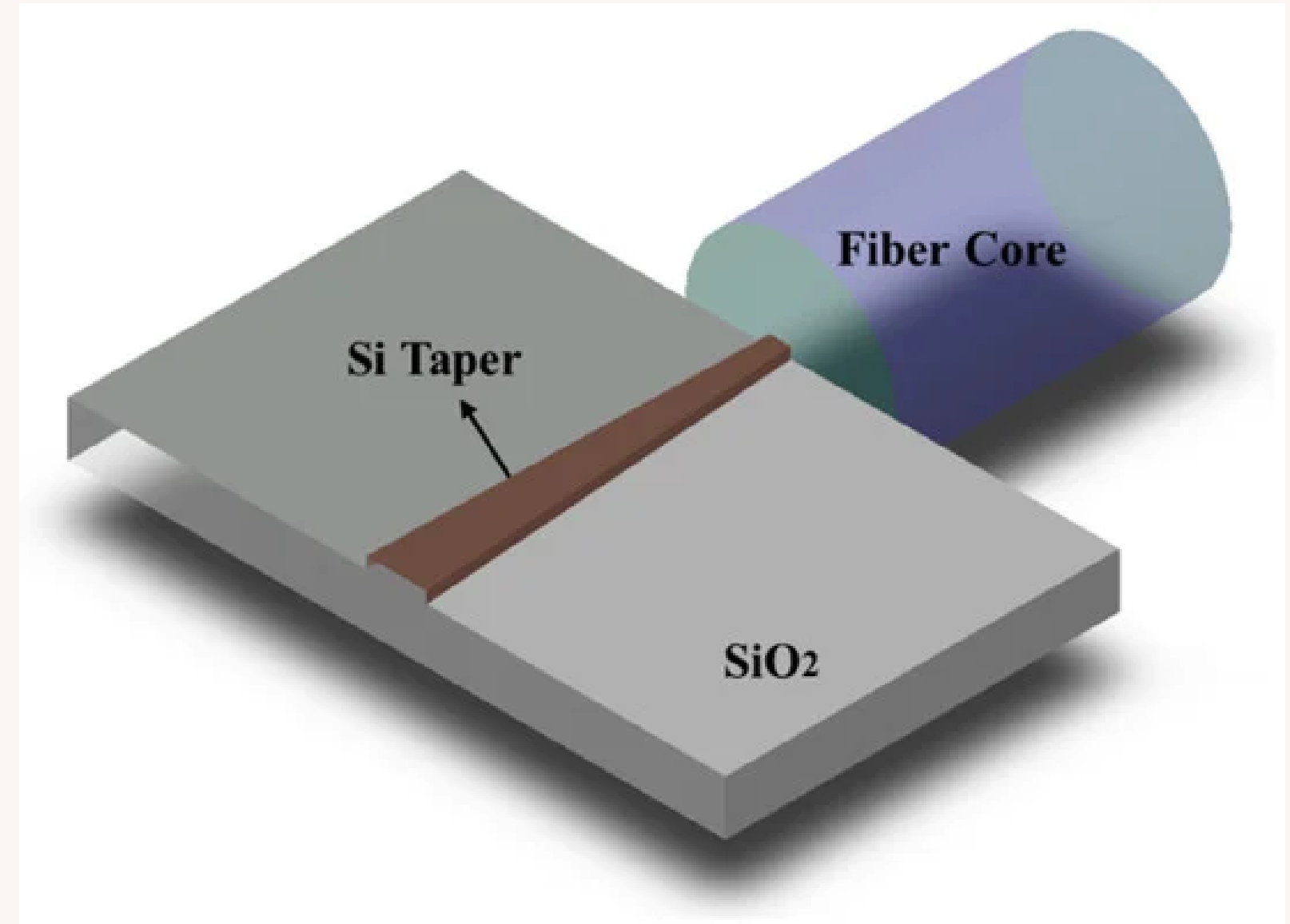# EDGE COUPLER

Leonardo Pessôa

OBJECTIVE

Generate, simulate and optimize an edge multi-modal edge coupler

Font: [1].
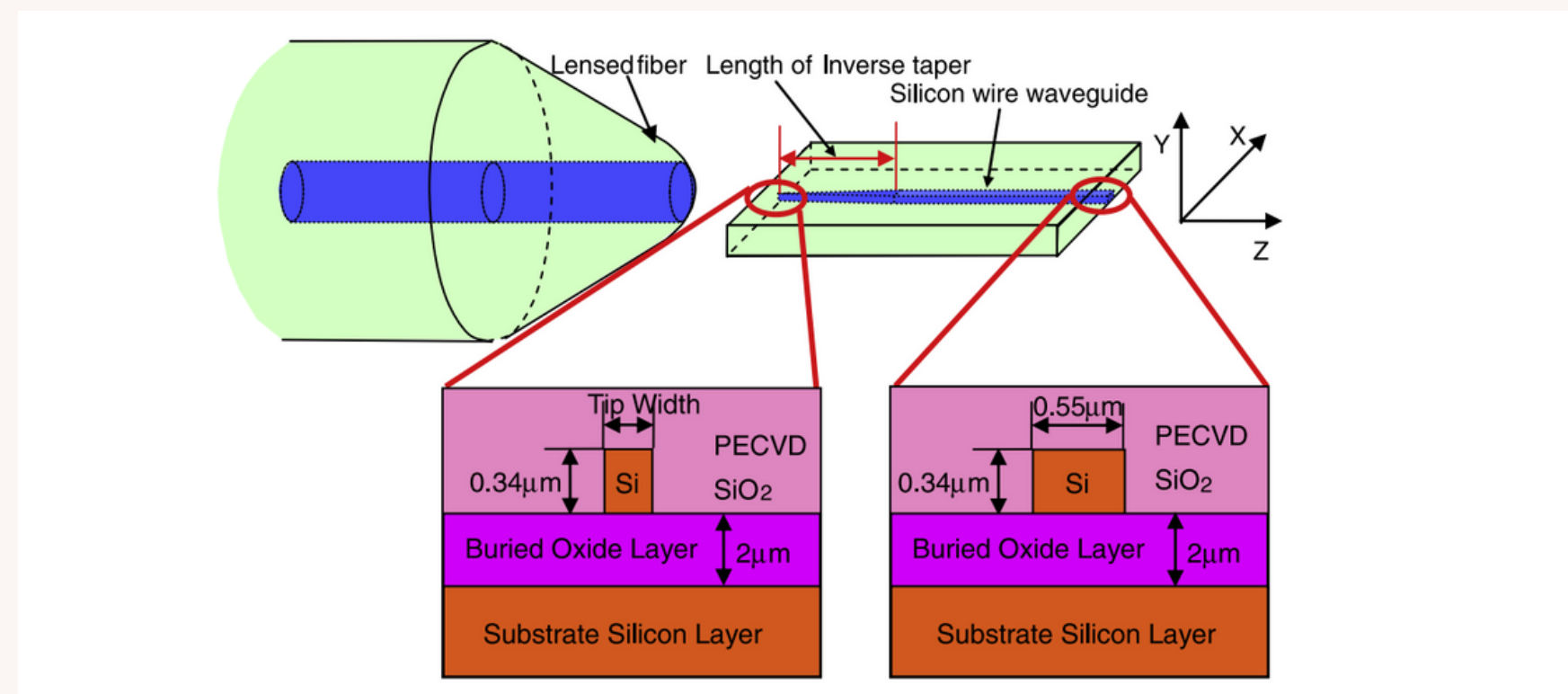
DIMENSIONS AND SHAPES

- For this compontent, the base article [2] graphics will be used as initial parameters and optimized on the latter weeks.

- The shapes to be analized are: linear, exponential and quadratic.

- The dimentions to be first analized are lenght and width.
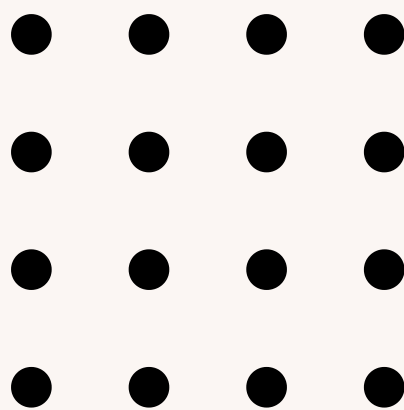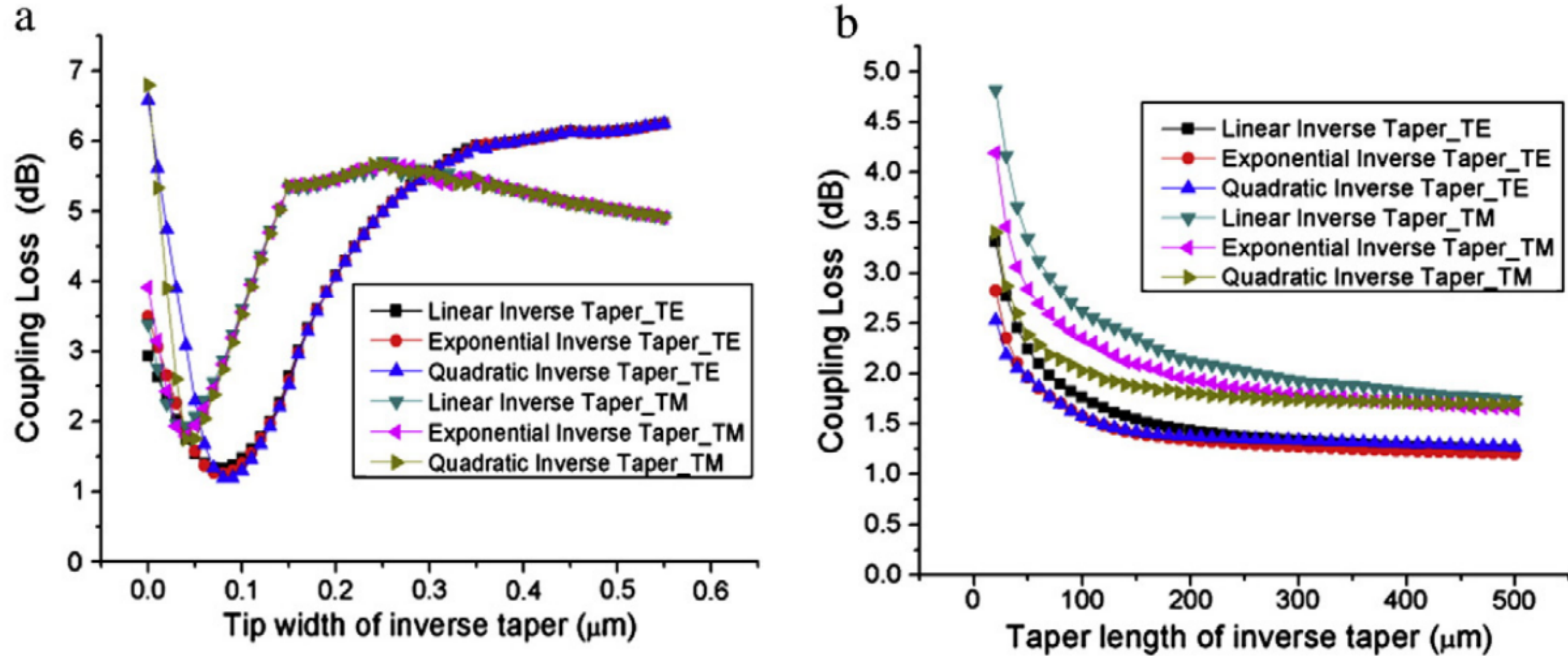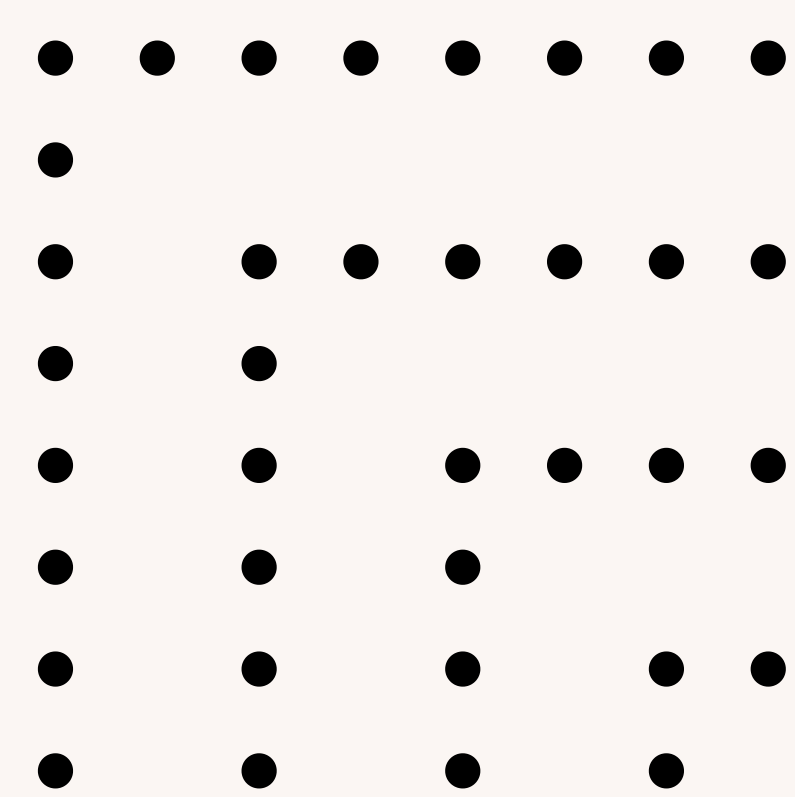
DIMENSIONS AND SHAPES

Font: [2].

Font: [2].
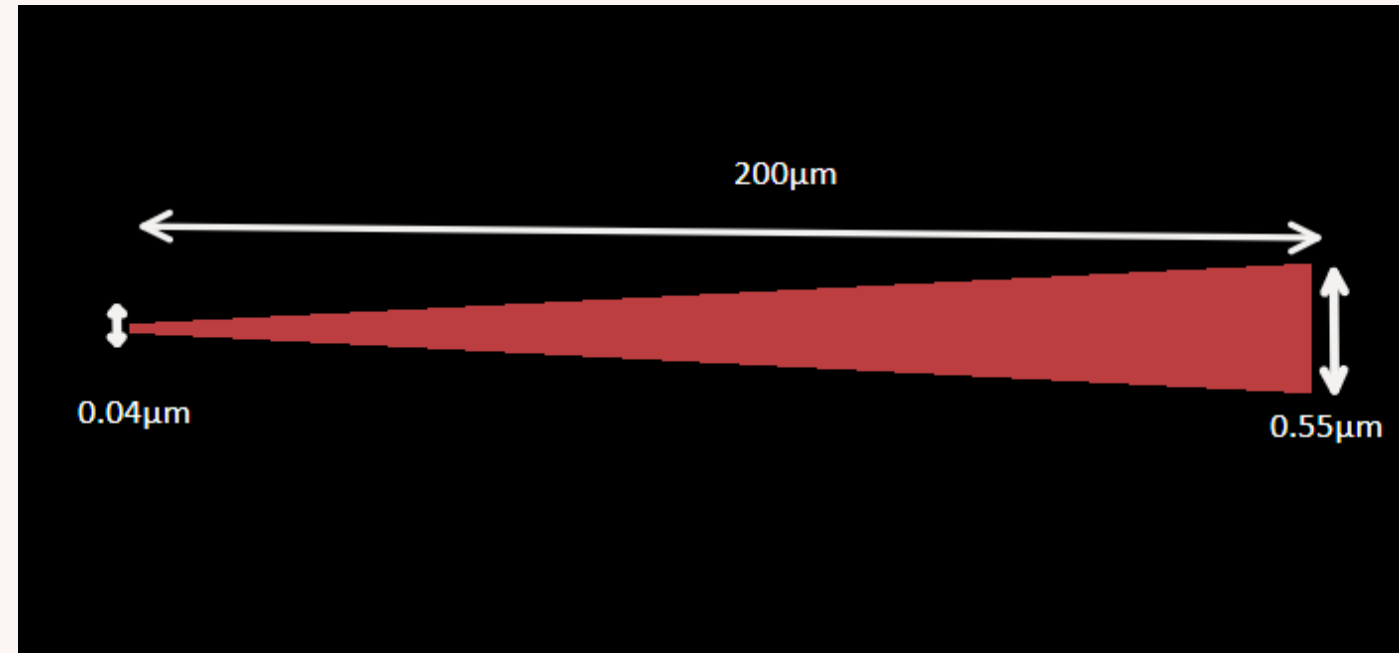
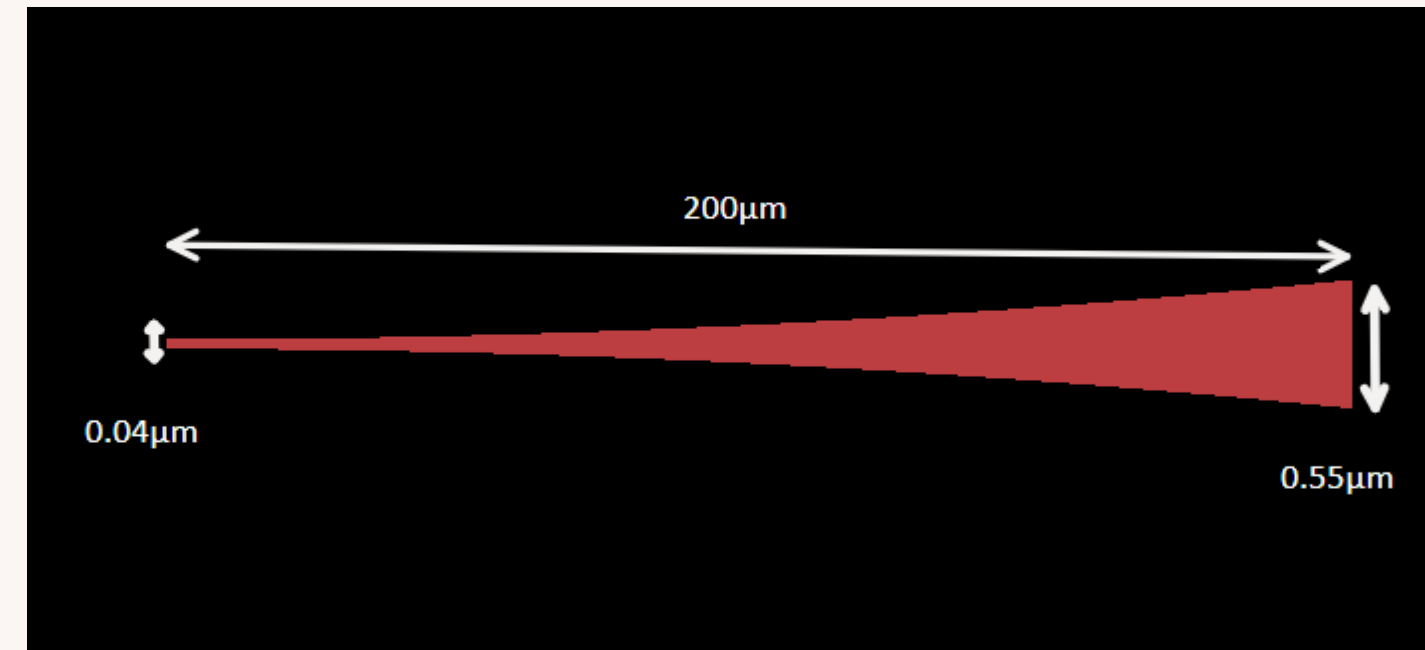# GENERAL GRAPHICS

Font: [2]

WEEK 1 OBJECTIVES

- Generate the taper and start simulations.
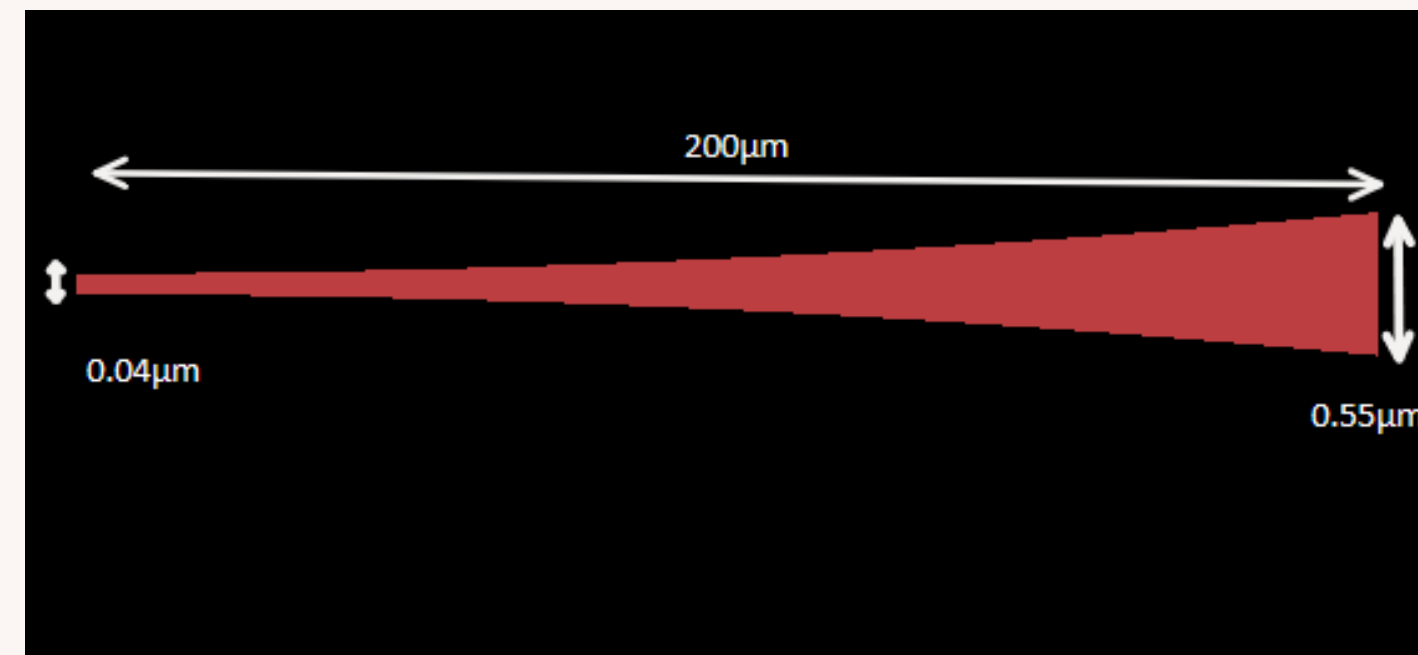- Test the diferent shapes of the taper.

CORE STRUCTURE

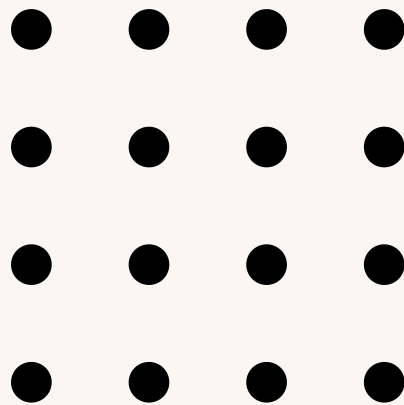## Using 5μm lenght for an better visualization
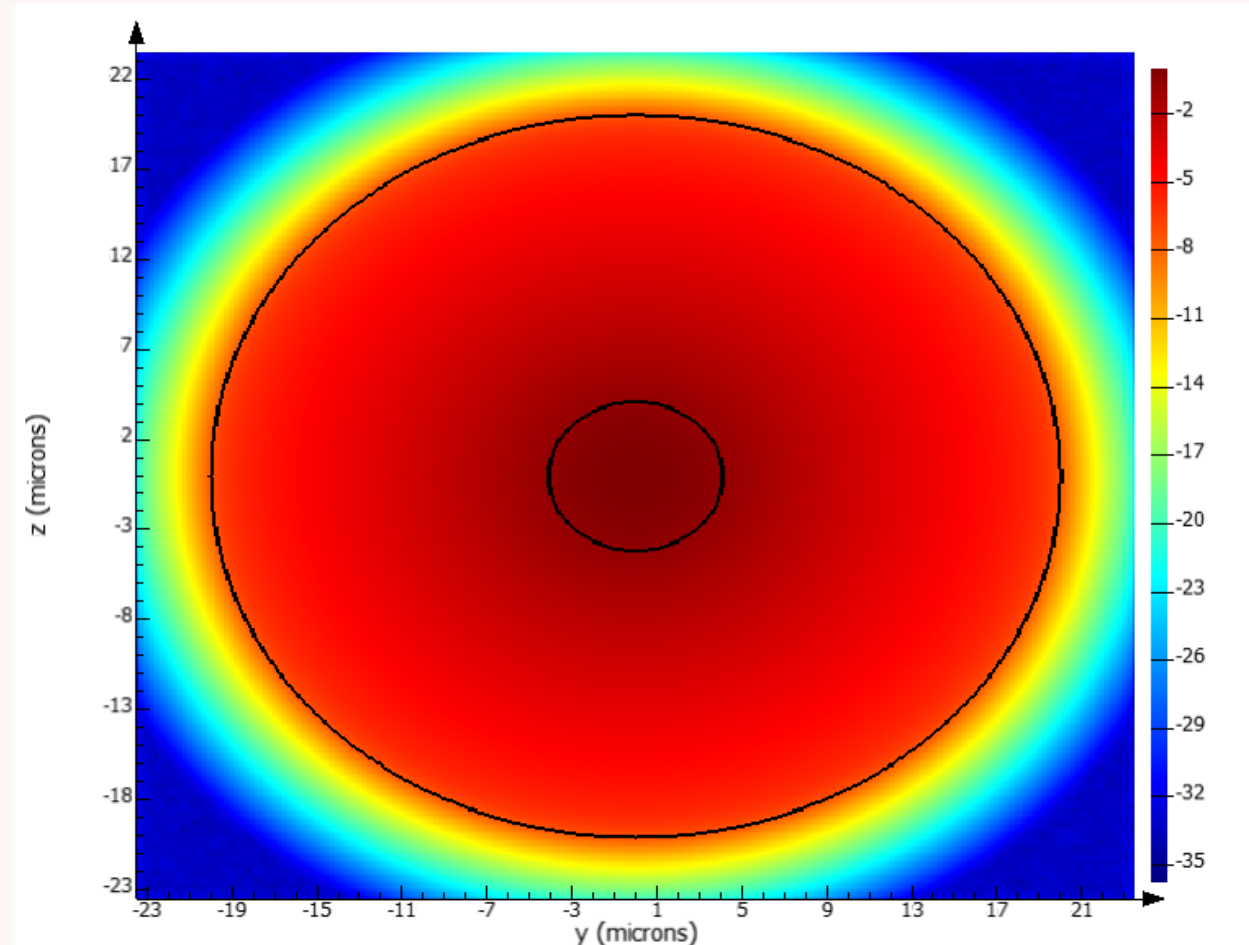

Linear Taper core (XY View)

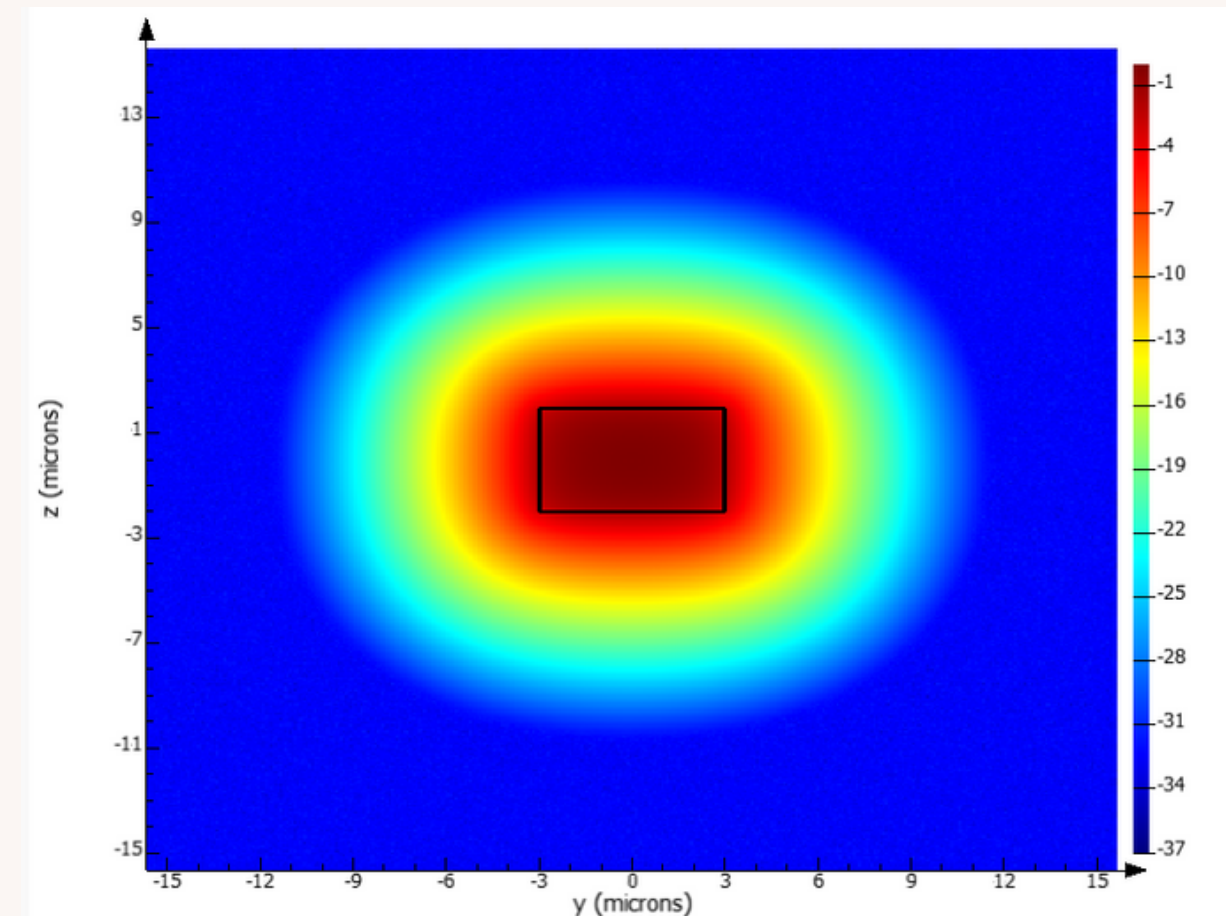Exponential Taper core (XY View)

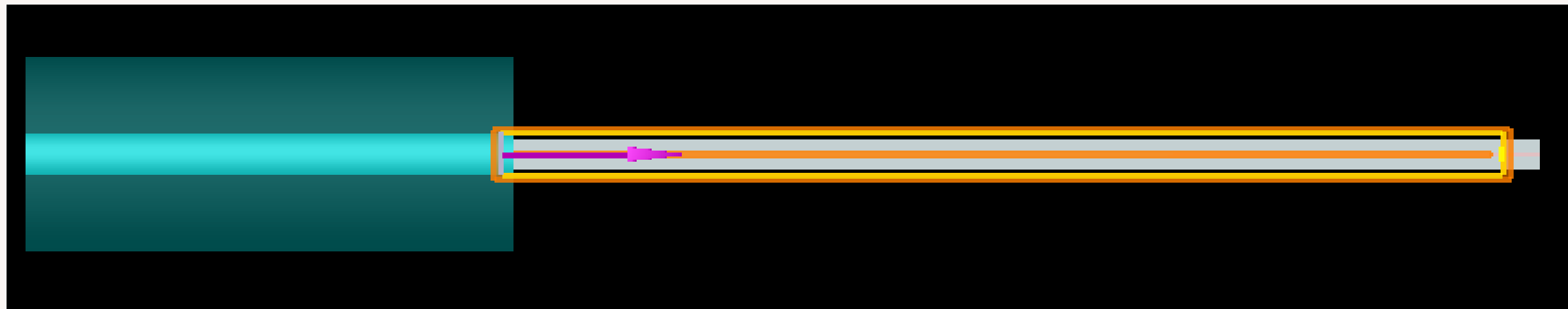Quadratic Taper core (XY View)
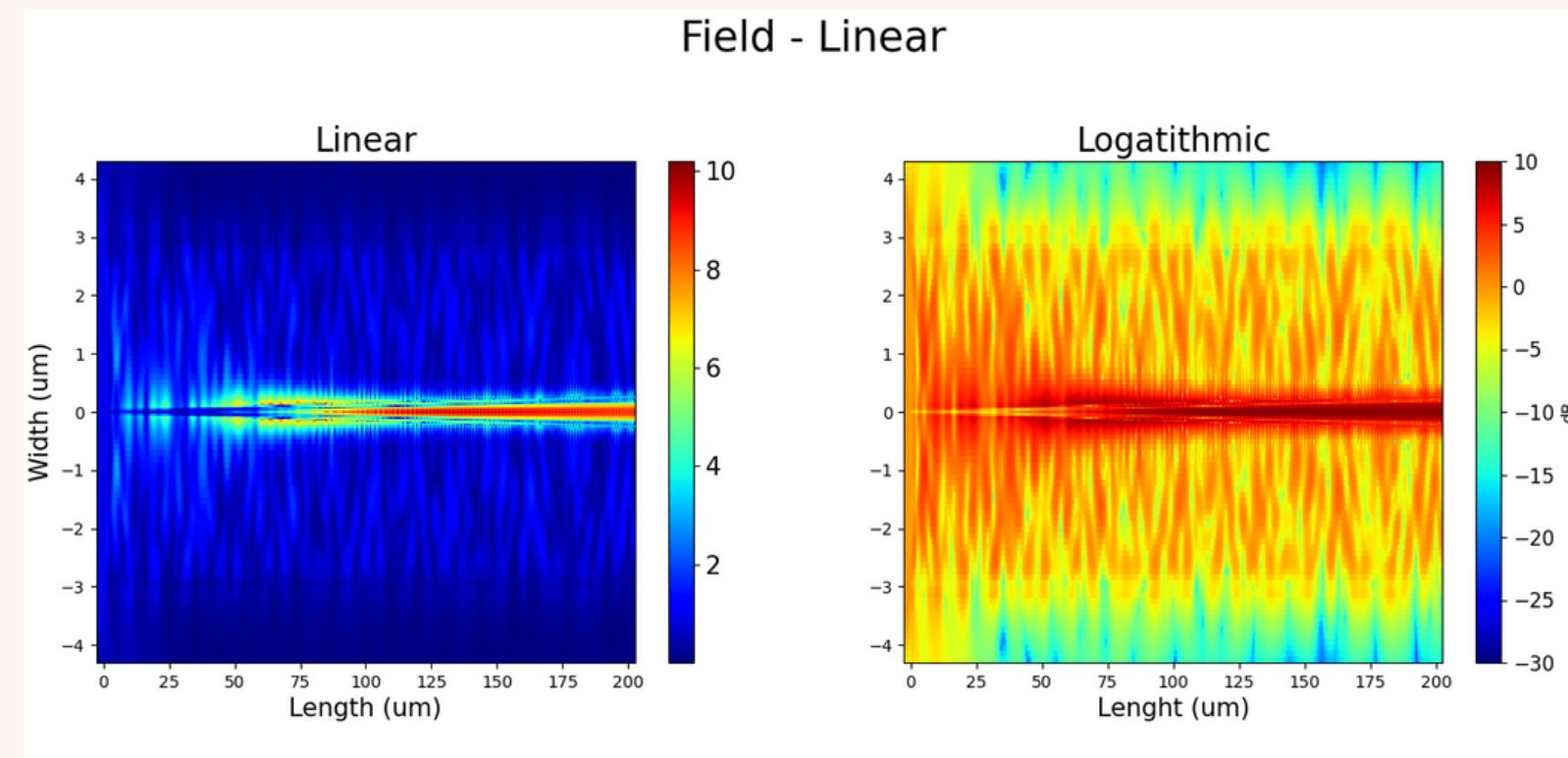
FDTD Guide

Fiber Confinement (Log)

Taper Confinement (Log)

FIELD RESULT
Using FDTD

Mesh accuracy: 2
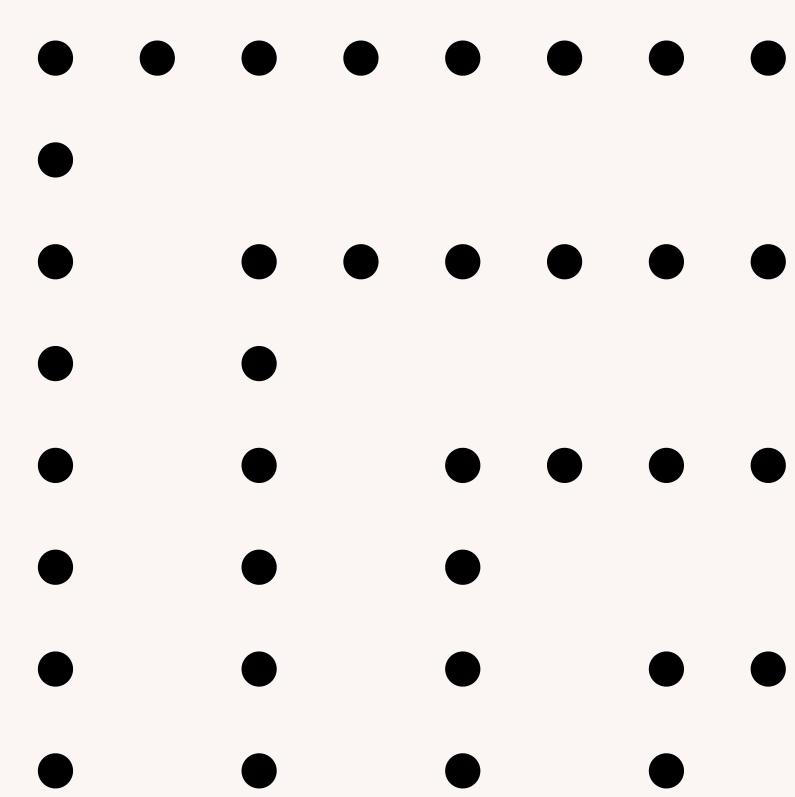Monitor frequency points: 200
Simulation time: 5000fs
FDTD dimensions:
y span: 8.5μm, z span: 8.5μm, x span: 205μm
Boundaries: z: Symmetric, x: PML, y: PML
Mode dimensions: z span: 8.5μm, y span: 8.5m
Simulation wavelength: 1500nm - 1600nm

WEEK 2
OBJECTIVES

- Fix the simulation errors obtained on the last week.

FIELD RESULT
Using FDTD

Mesh accuracy: 2

Monitor frequency points: 51

Simulation time: 5000fs

FDTD dimensions:

y span: 8.5μm, z span: 8.5μm, x span: 205μm

Boundaries: z: Symmetric, x: PML, y: PML
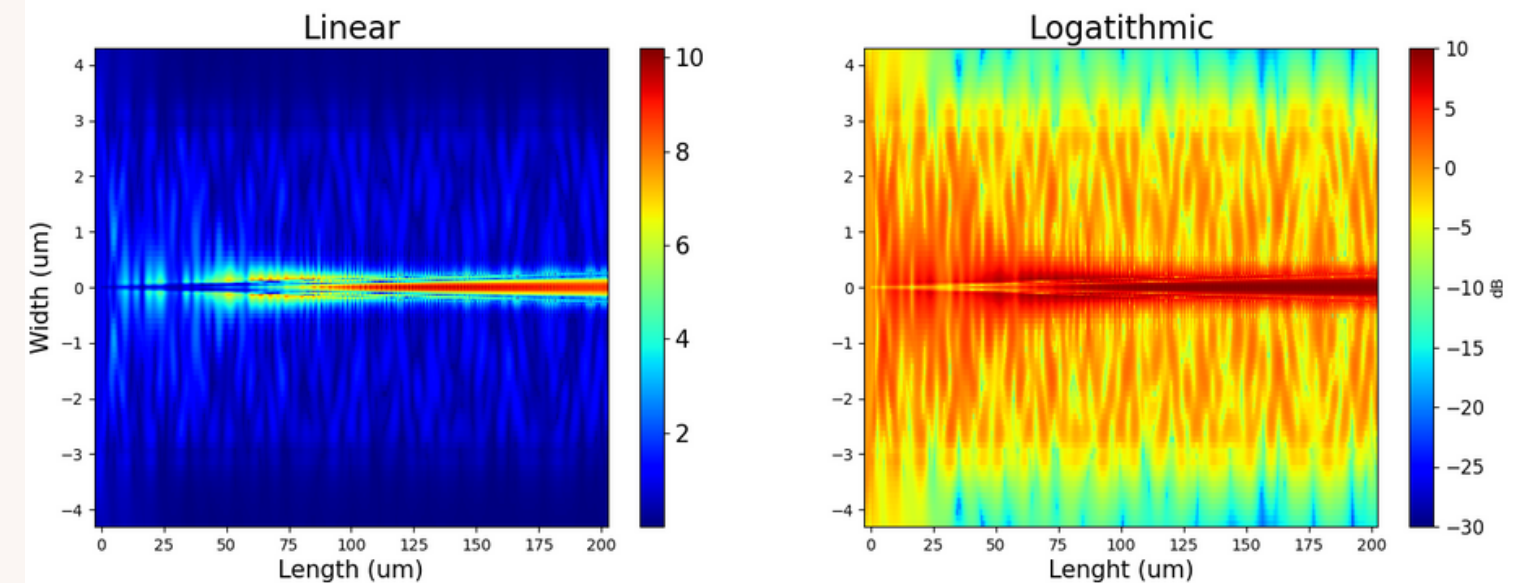
Mode dimensions: z span: 8.5μm, y span: 8.5m
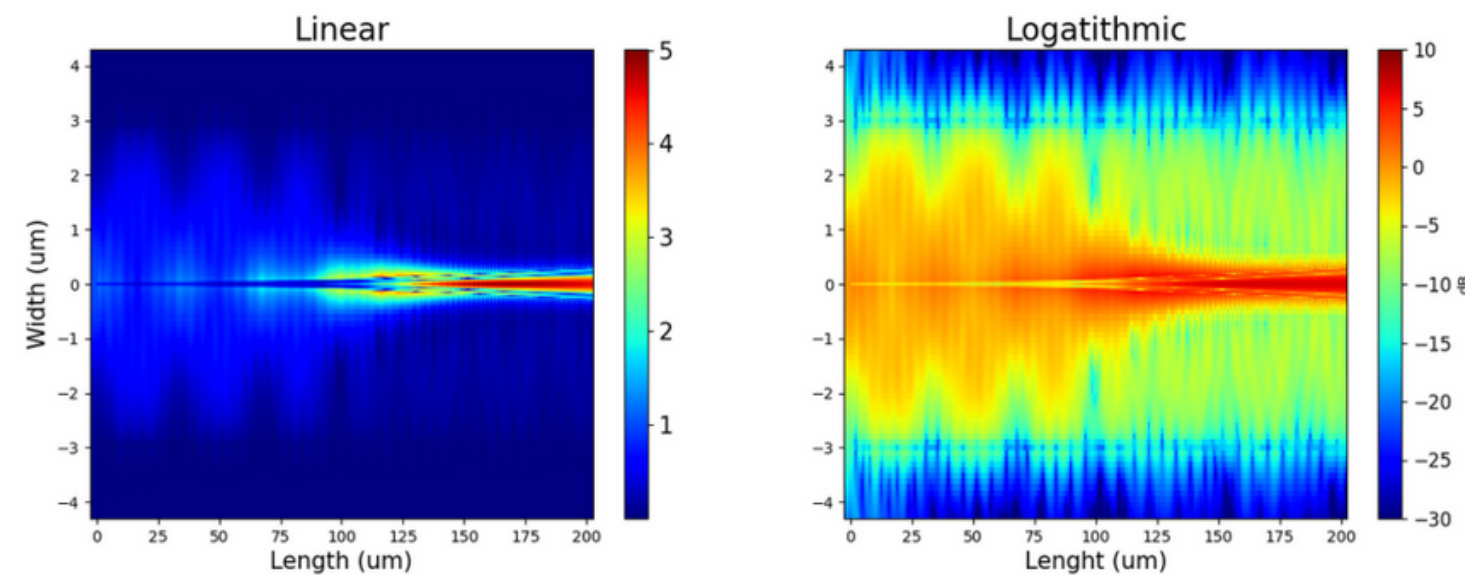
Simulation wavelength: 1500nm - 1600nm

Mesh on the core: equivalent x,y,z index 5

Output monitor dimensions: y span: 3μm, zspan: 3μm

INSERTION LOSS RESULT
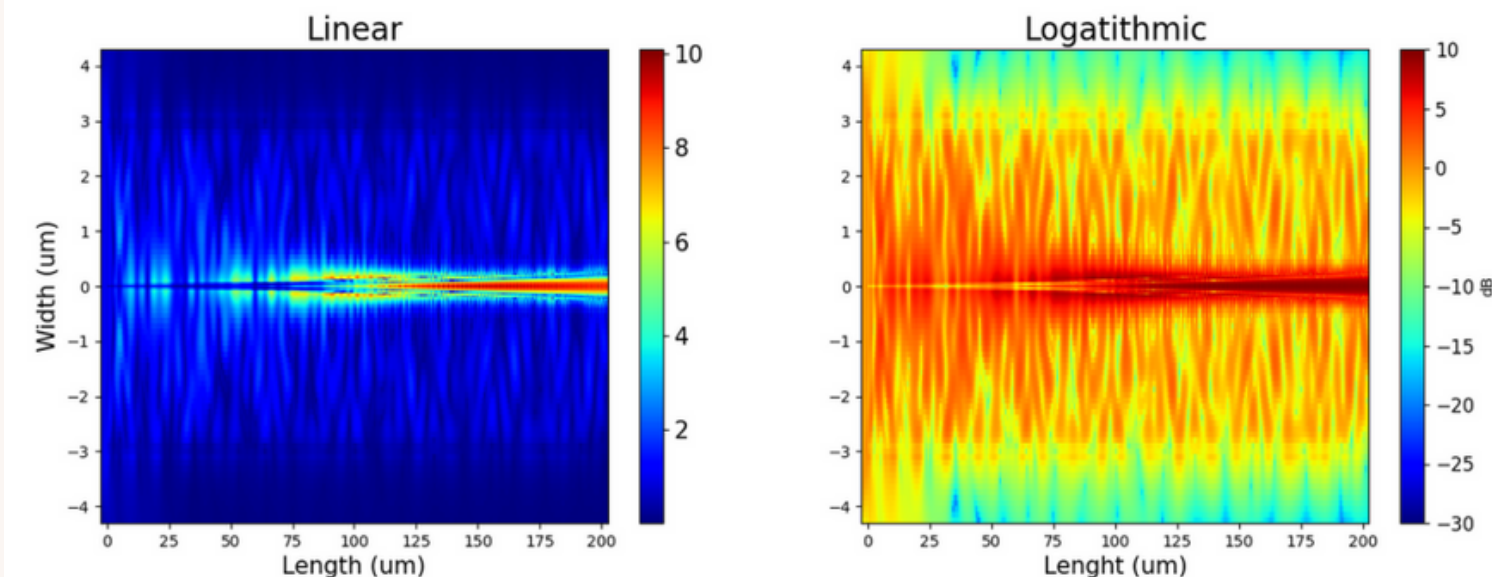## Using FDTD
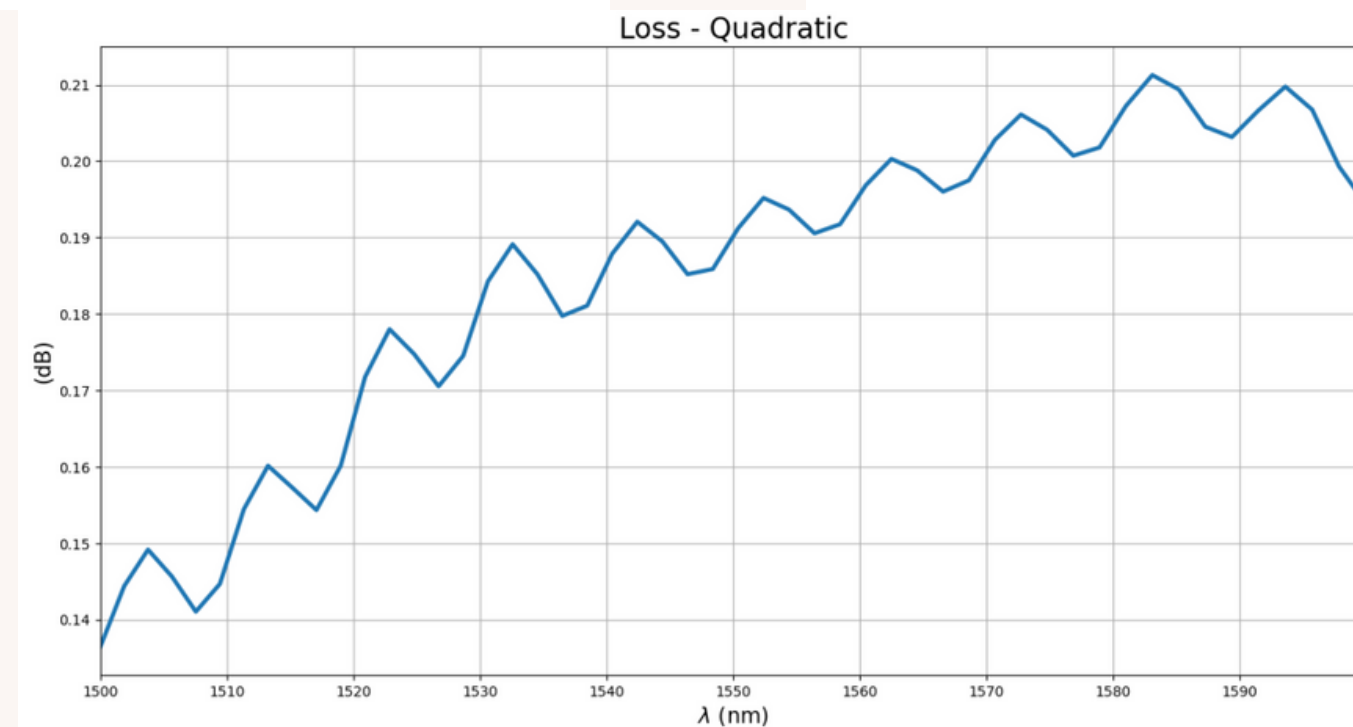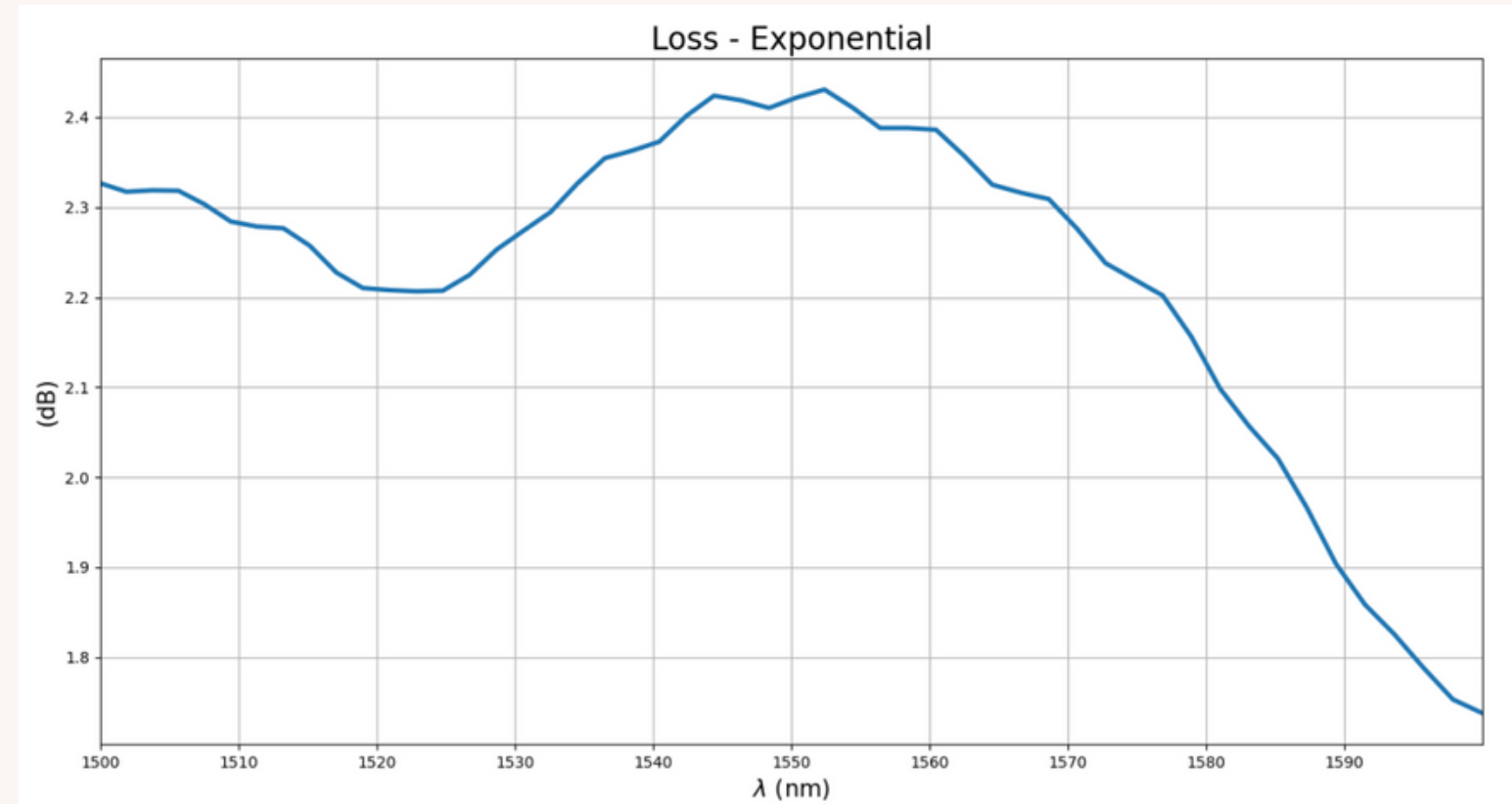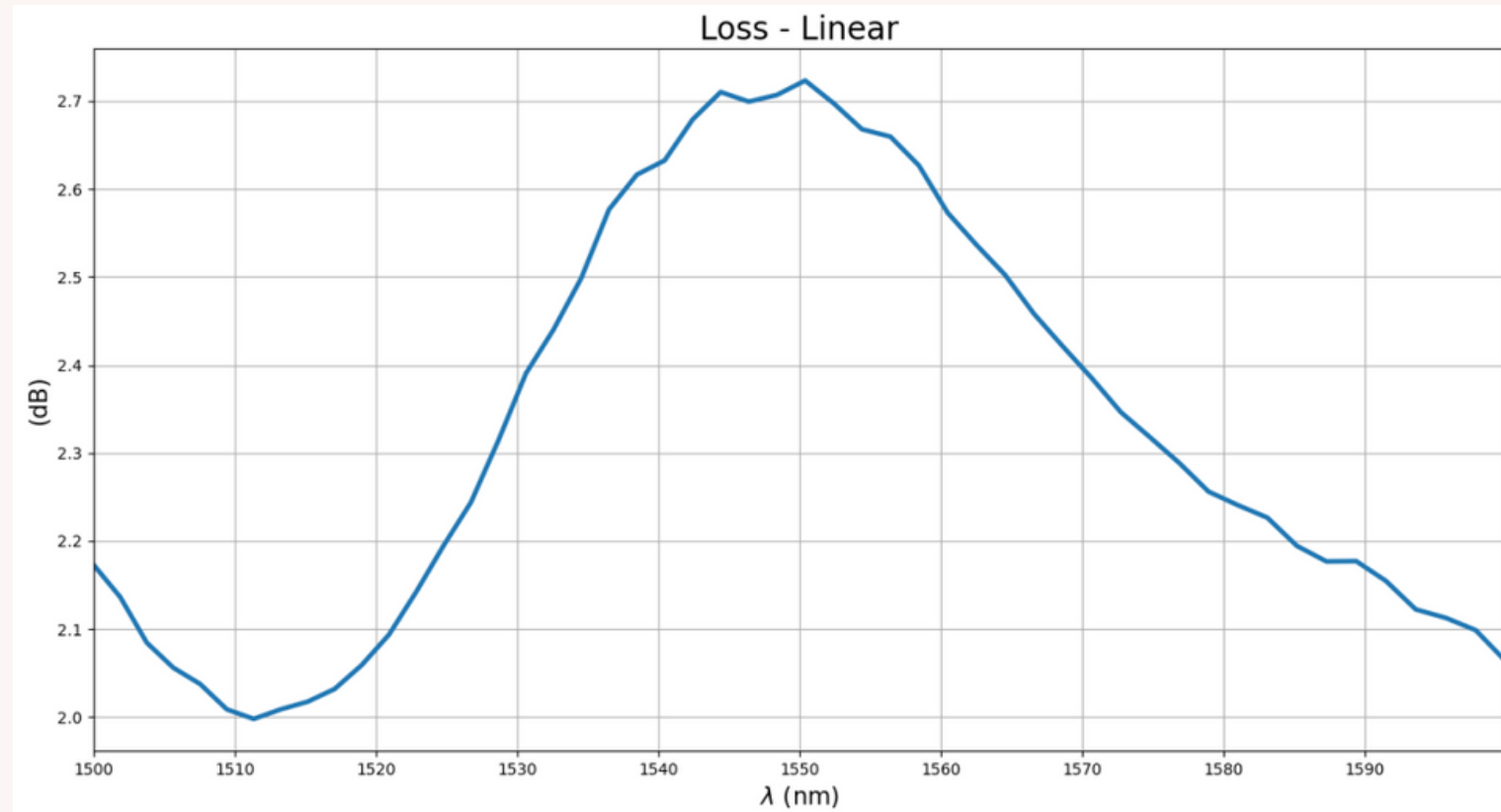
WEEK 3 OBJECTIVES
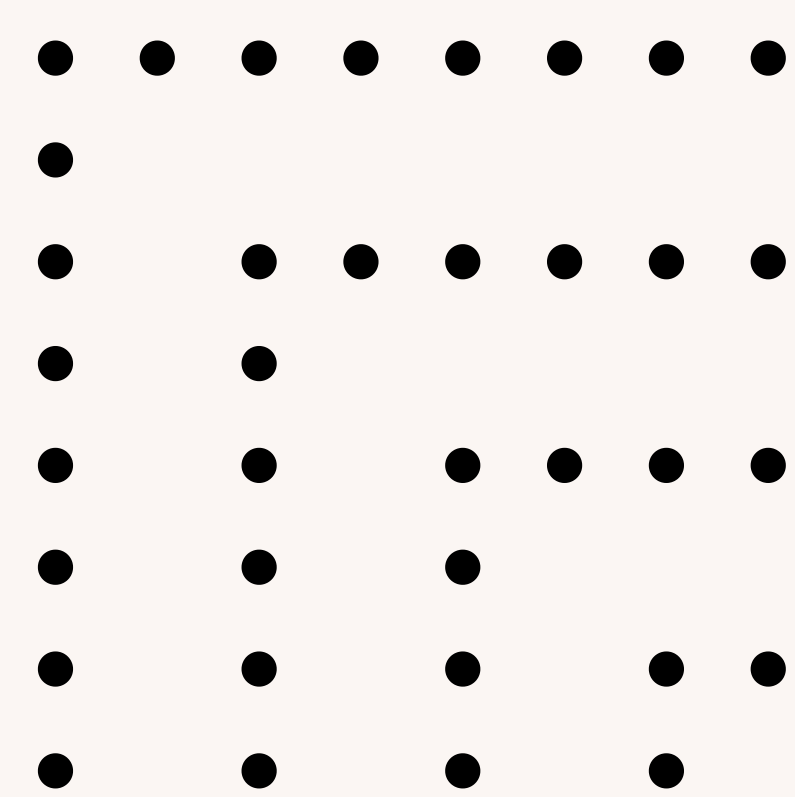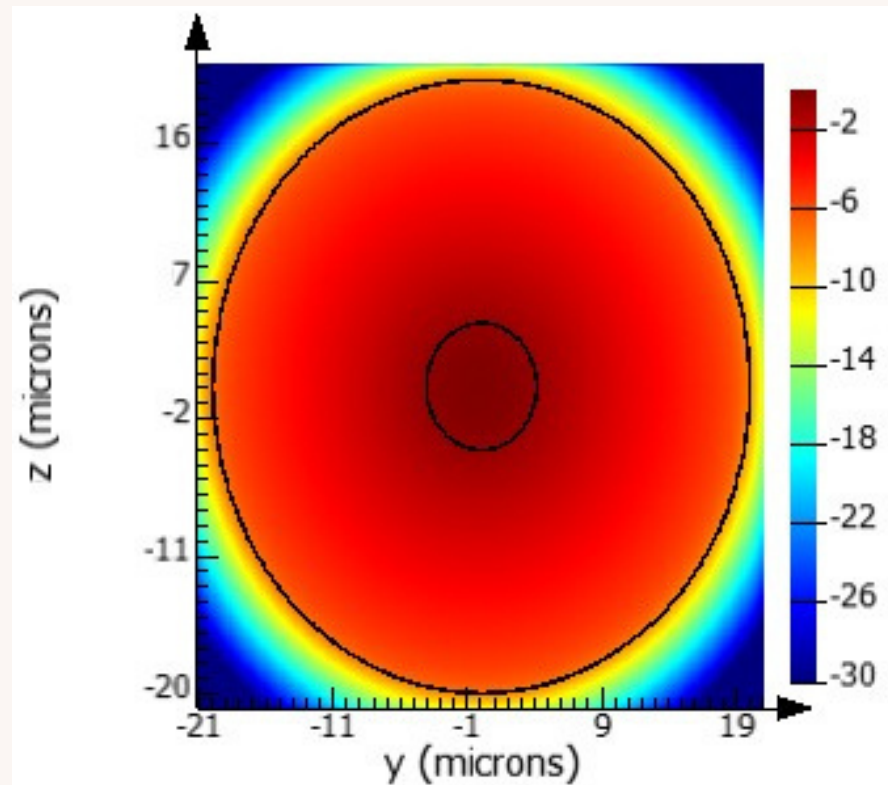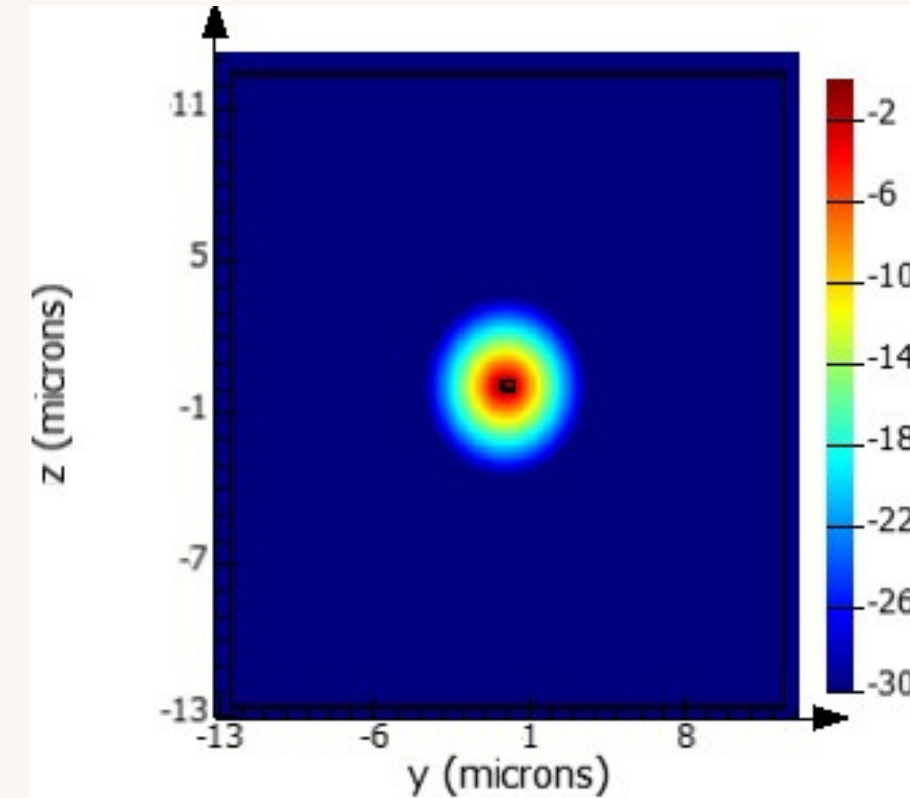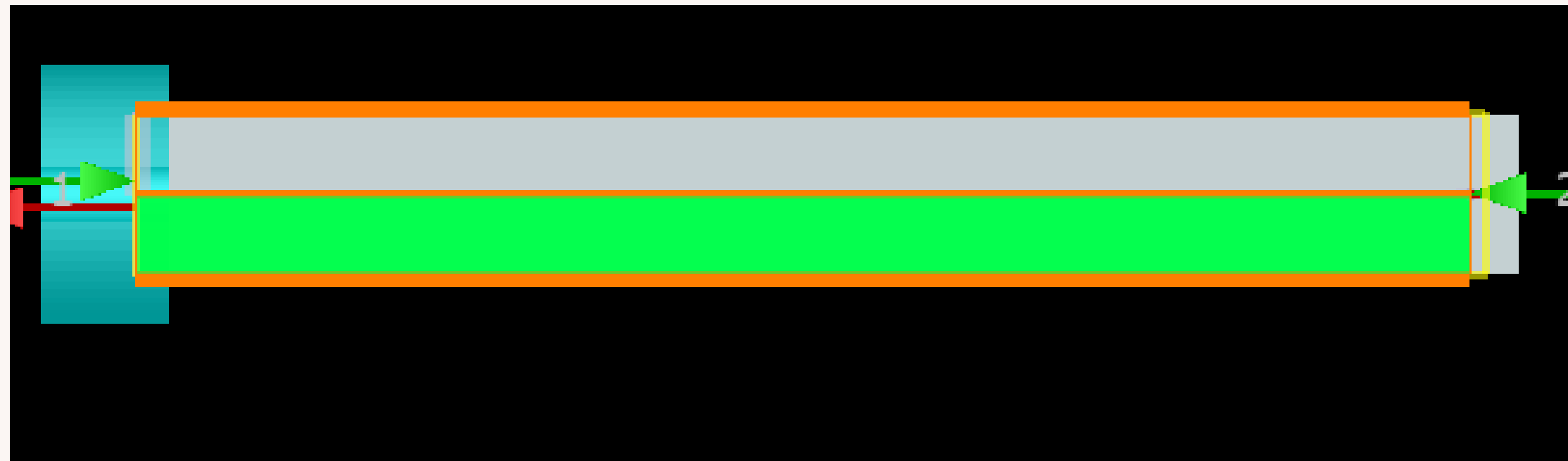
- Use EME simulations to obtain better results.
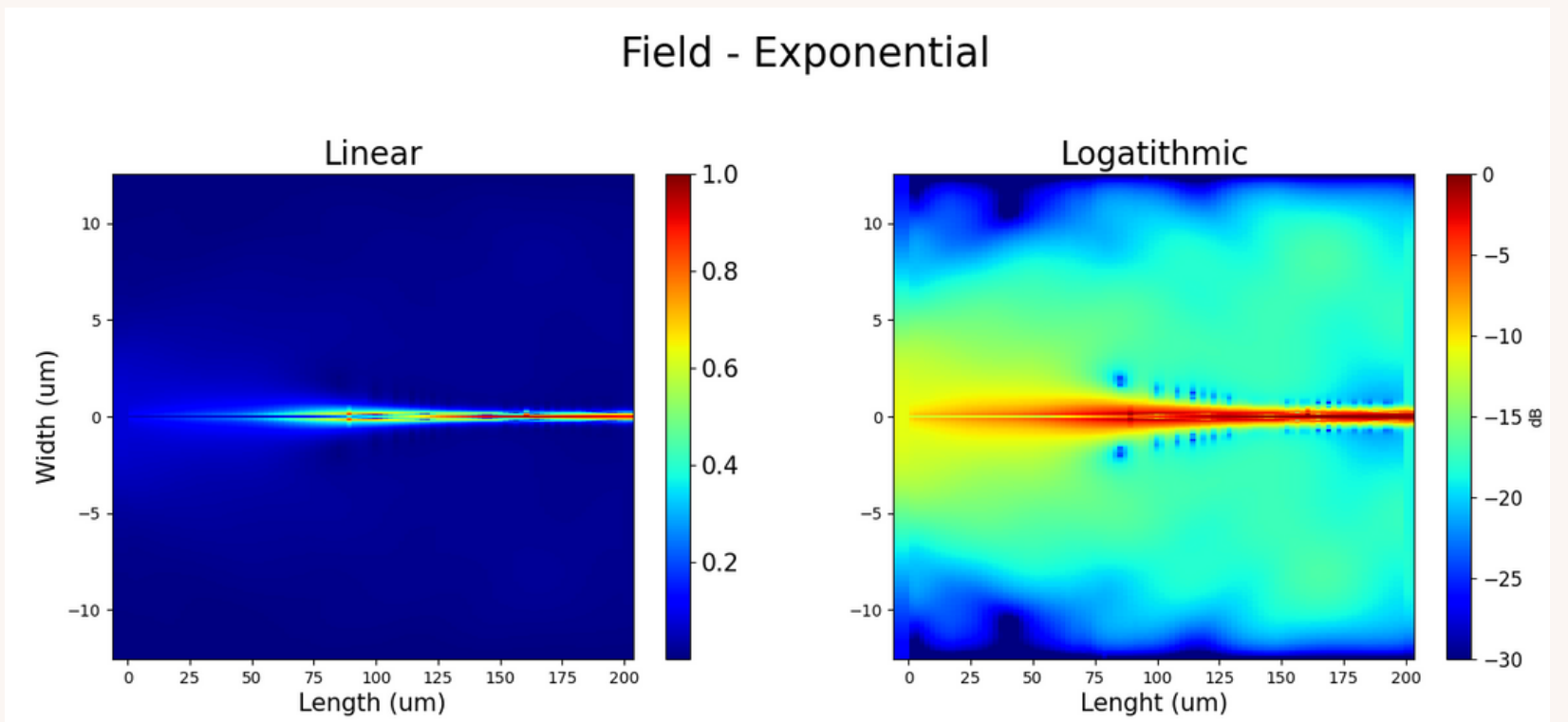
MODE Guide

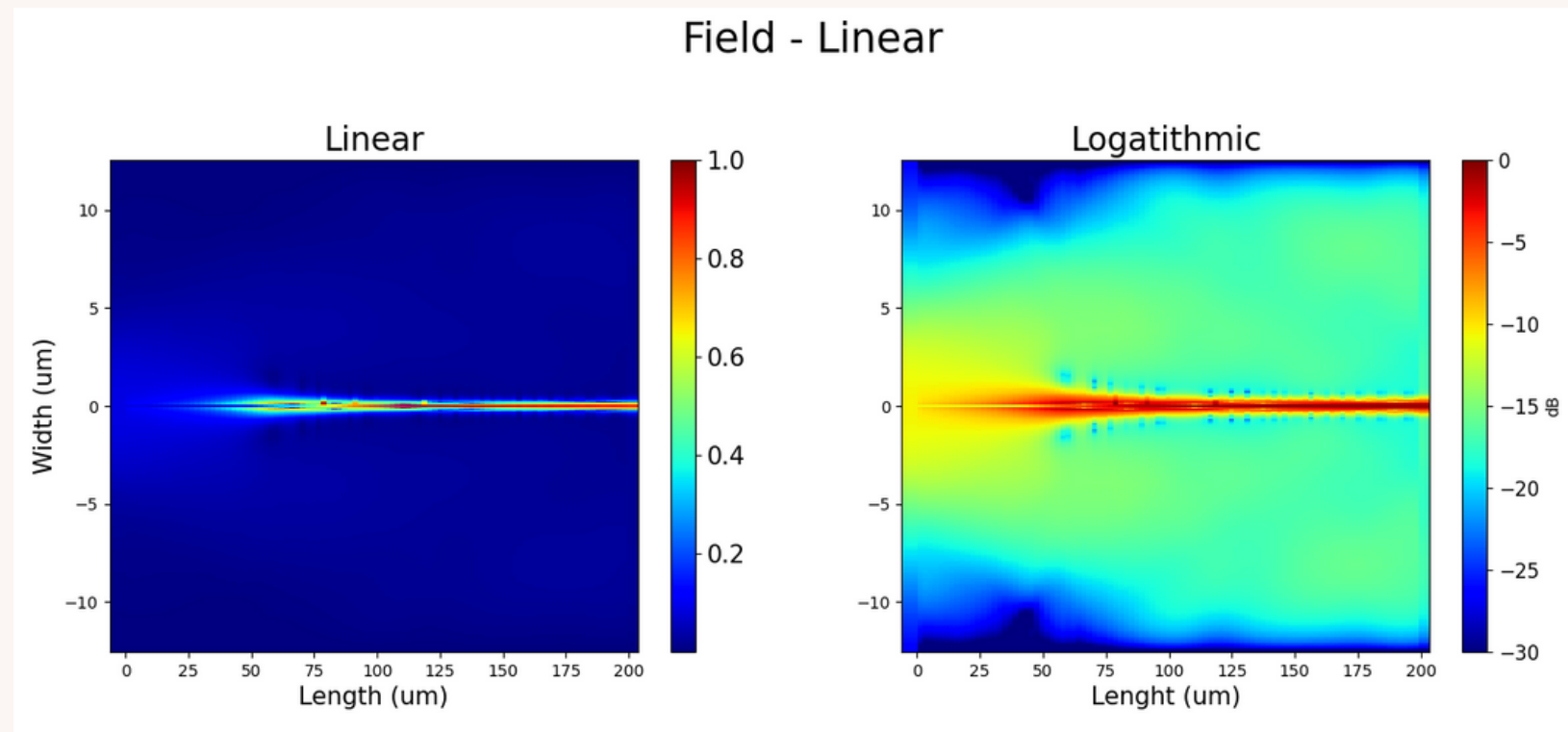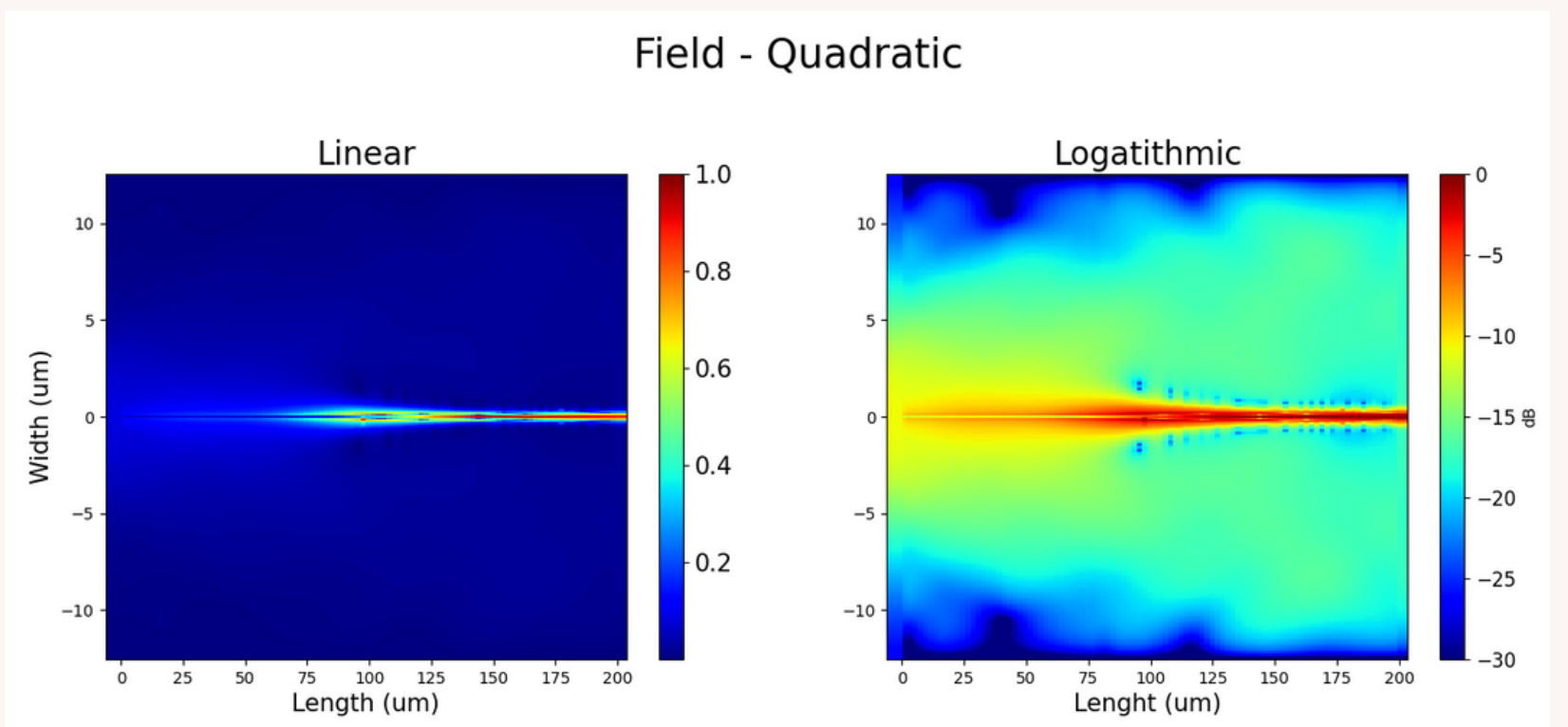Fiber Confinement (Log), using FDE

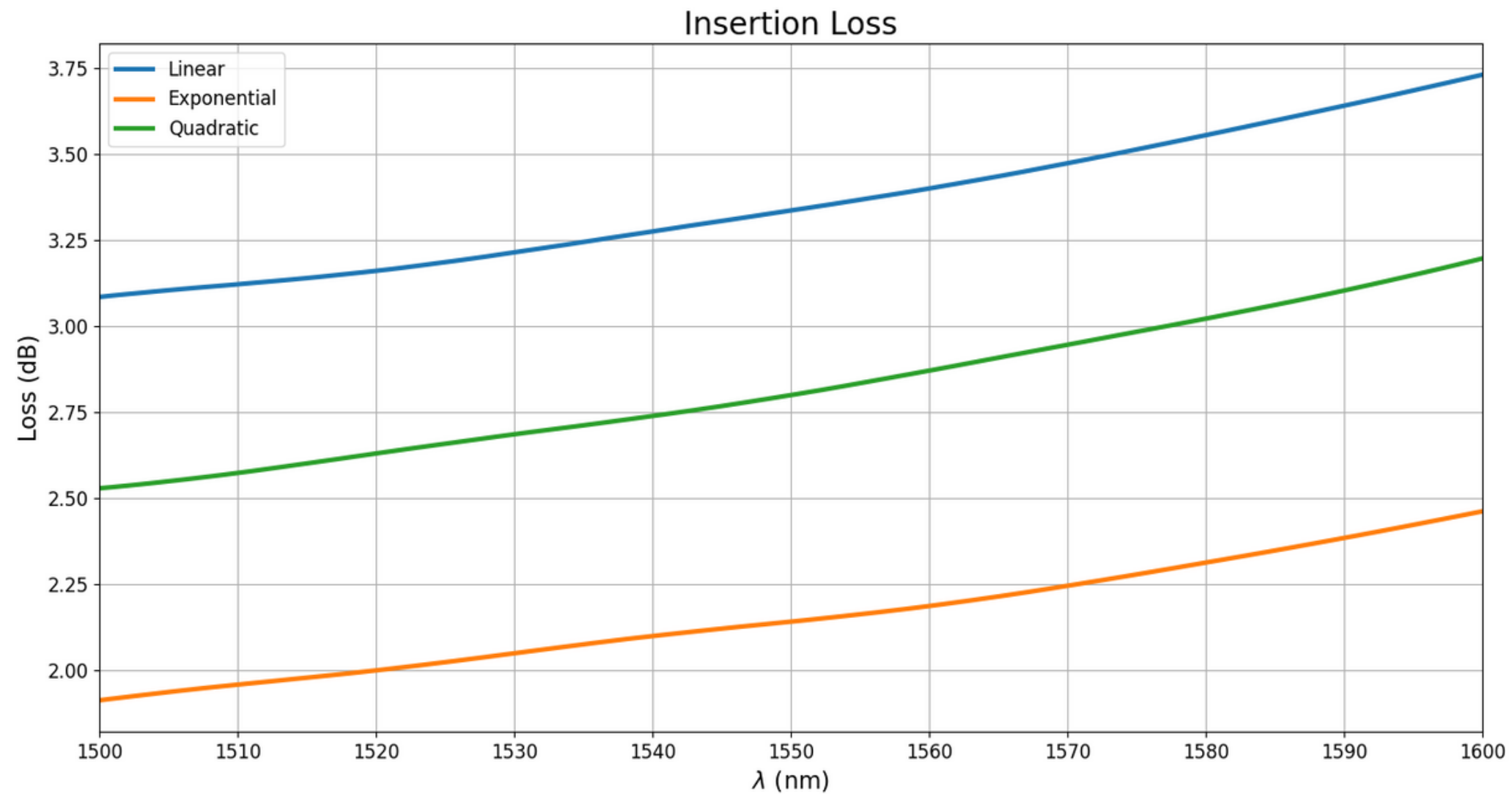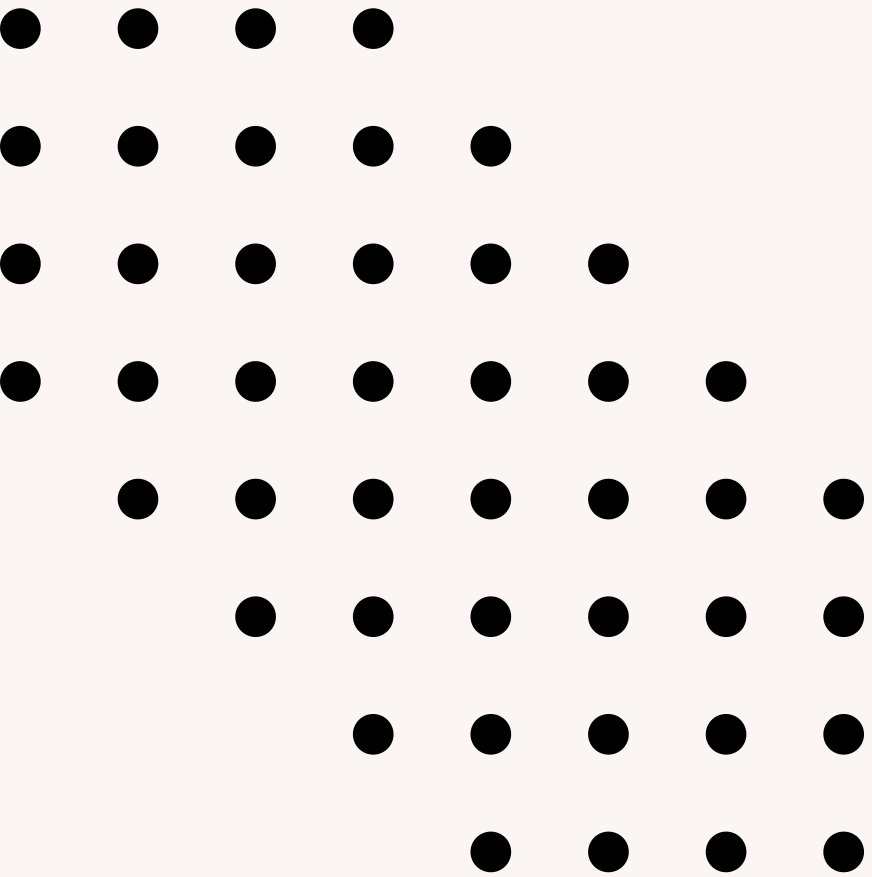Taper Confinement (Log), using FDE

FIELD RESULT
Using EME

Mesh cells: 250
EME dimensions:
y span: 25µm, z span: 25µm, x span: 205µm
Boundaries: z: Symmetric, y: Anti-symmetric
Output: z span: 5µm, y span: 2µm
Simulation wavelength: 1550nm
Cells: [1, 60, 1]
Modes: [5, 45, 5]
Mesh multiplier: y: 3, z: 1.5

Sweep Results

References

[1] Mu, Xin, et al. "Edge couplers in silicon photonic integrated circuits: A review." Applied Sciences 10.4 (2020): 1538.

[2] Ren, Guanghui, et al. "Study on inverse taper based mode transformer for low loss coupling between silicon wire waveguide and lensed fiber." Optics Communications 284.19 (2011): 4782–4788.