

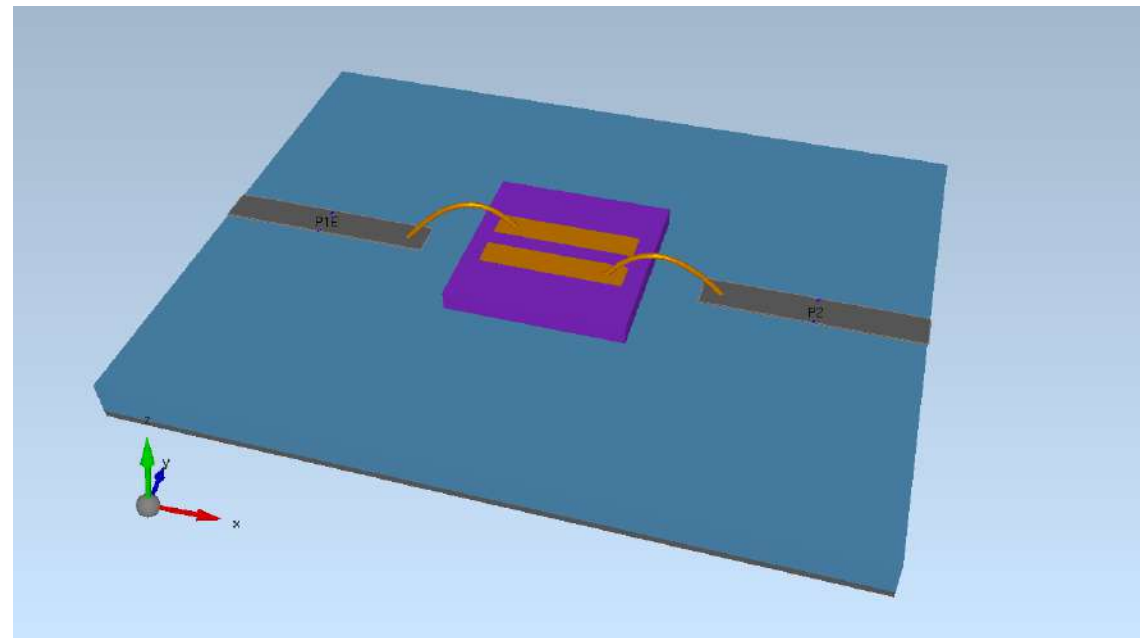
EMPIRE XPU Tutorial

2D Design - Introduction



Overview

- 2D Design
- Views
- Groups and Properties
- Components and Sources
- Field Monitor
- Working with groups
- Changing objects
- Creating basic objects
- Creating library objects
- Copy operations
- Simulation



Start

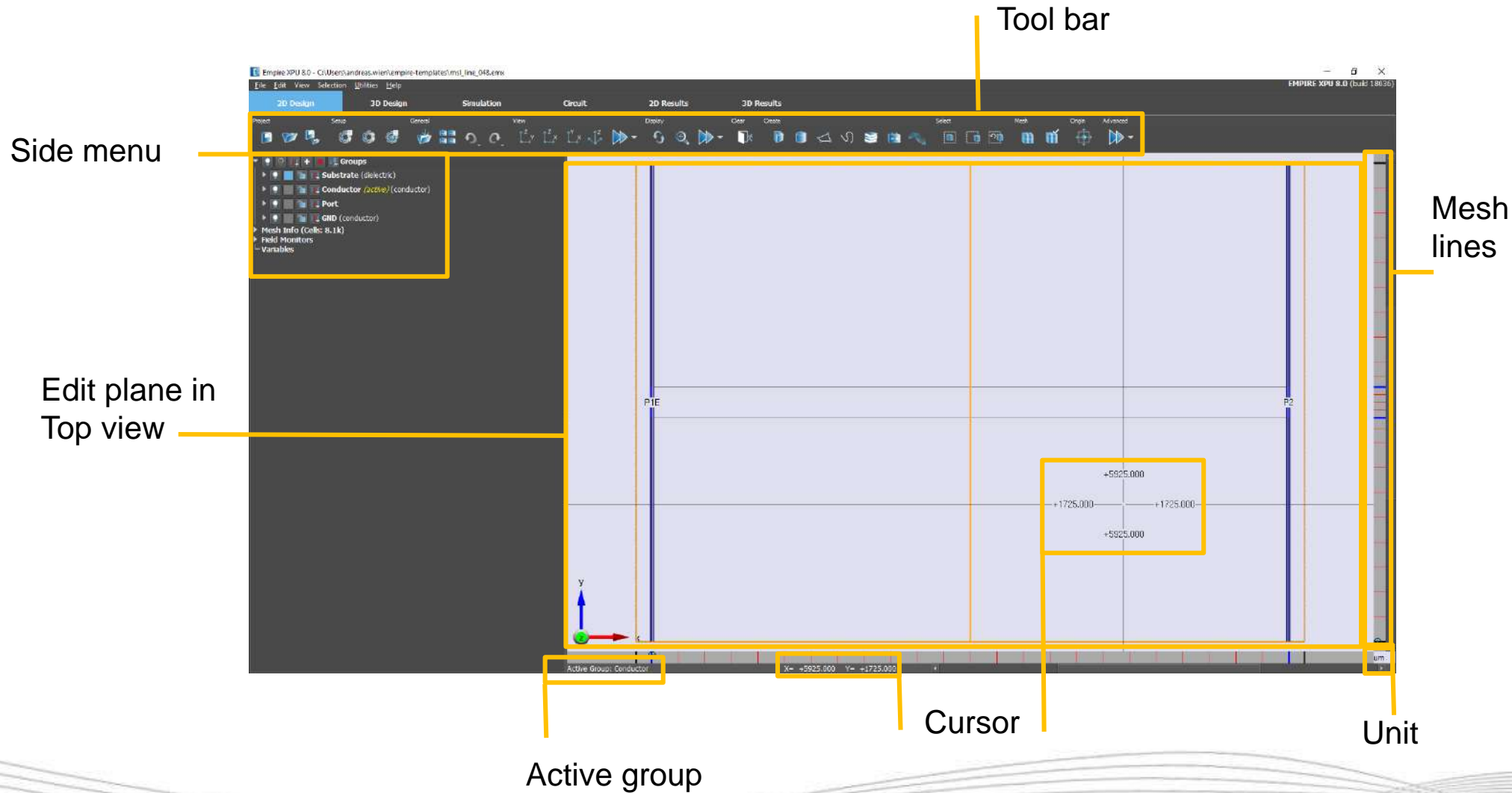
Help:

- Simulation flow and an overview of basic features are explained in „Getting Started.pdf“
- Complete manual is available in EMPIRE-Manual-800.pdf
- Videos are available at:
<https://www.youtube.com/channel/UCb38NsUTmqSSL5IWNG7vPhg>
- Send questions to empire.support@imst.de (include input file .emx if applicable)

Steps:

- Start Empire XPU
- Select “Templates”, click “OK”
- Select File → “Save”
- Confirm default folder selection
- Click „2D Design“ tab on top

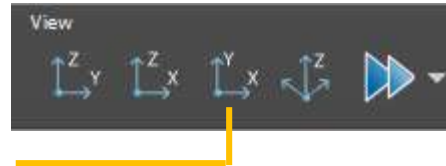
2D Design



Views

Steps

- Click View Icons
- Return to xy view
- Zoom:
 - Turn wheel forward / backward (zoom is centered to cursor position)
 - Use Zoom Icons on top
 - Drag cursor to span an arrow, press w shortcut
- Pan:
 - Use Scroll bars on right and bottom
 - Use up / down / left / right arrow keys
- Click “Zoom extents”



Zoom extents (z shortcut)



Zoom area

Groups and properties

Edit Property

Name

Active group

Color

Property

Group height

Steps:

- Open Groups list in Side menu
- Double click on Property in group Substrate
- OK, Close Groups list

Material selection

Property Editor - Dielectric

Material Property

- Dielectric
- Conductor
- Absorber
- Advanced
 - Advanced Material
 - Debye Material
 - Drude/Plasma Material
 - Meta Material
 - Gabriel Material
 - Conformal Dielectric
 - Material Scripts
 - Material Script
 - Drude/Plasma Script
- Circuit Property
- Thermal Property
- Mesh Property
- Advanced Property
- User Defined

General Parameters

Name: Rogers-TMM-10

Geometric Priority (10...250): 100

Electric Parameters

Rel. Permittivity: 9.20000

Electric Loss Tangent: 2.20000e-03

Conductivity in 1/(Ohm*m): 0

Thermal Parameters

Conductivity in W/K/m: 7.60000e-01

Surface Heatbank Coefficient (W/m^2/K): 20

Surface Radiation Emission Coefficient (rel.): 1

SAR/EI/ACD Parameters

SAR/EI/ACD mass density in g/cm^3: 0

OK Advanced Cancel Help

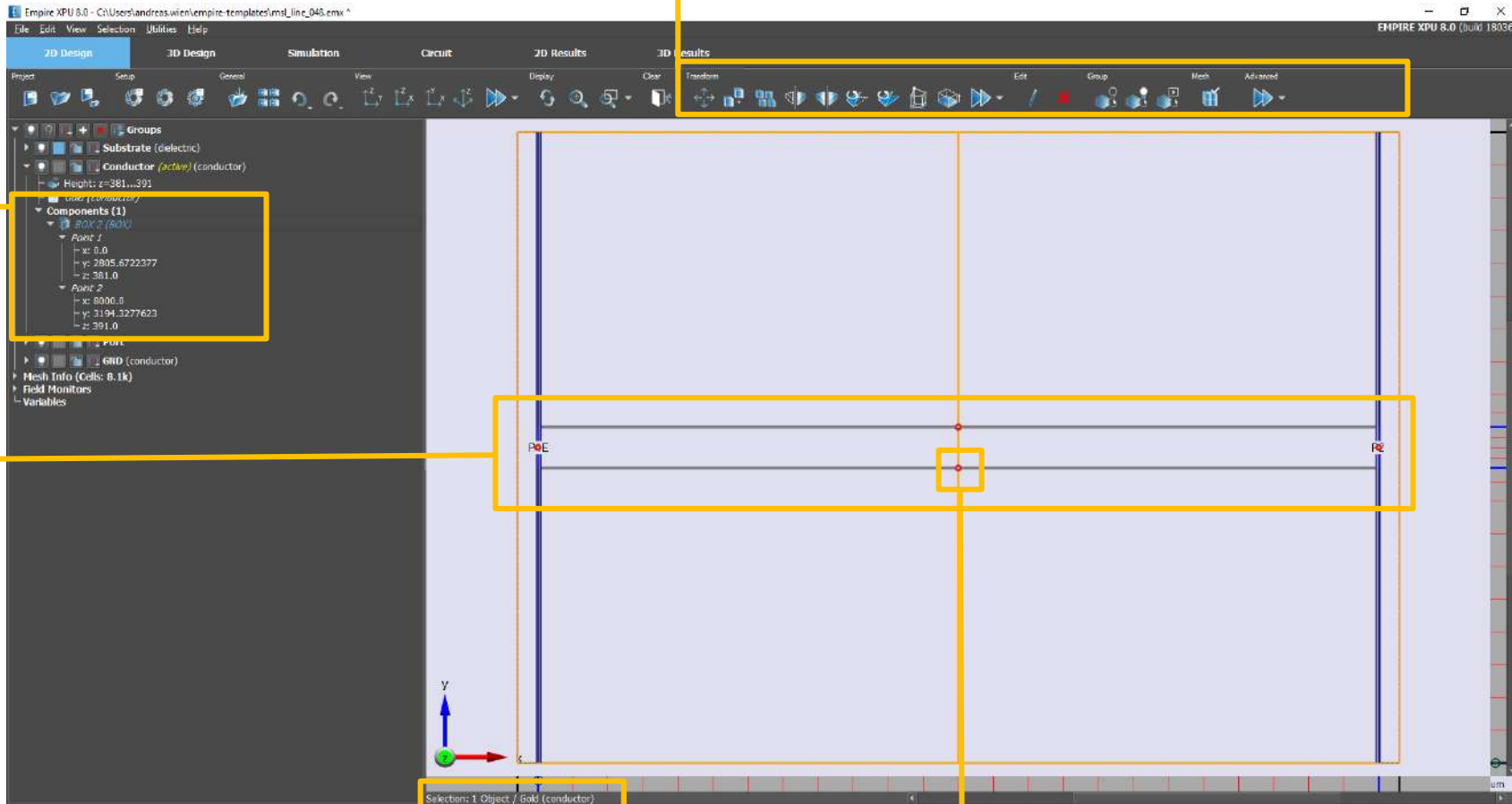
Material properties

Components

Case sensitive toolbar (depend on selections)

Object coordinates and parameters

Selected object



Steps:

- Open Group Conductor, open Components
- Left click on „Box 2“ in side menu to select
- Esc to deselect, Close list

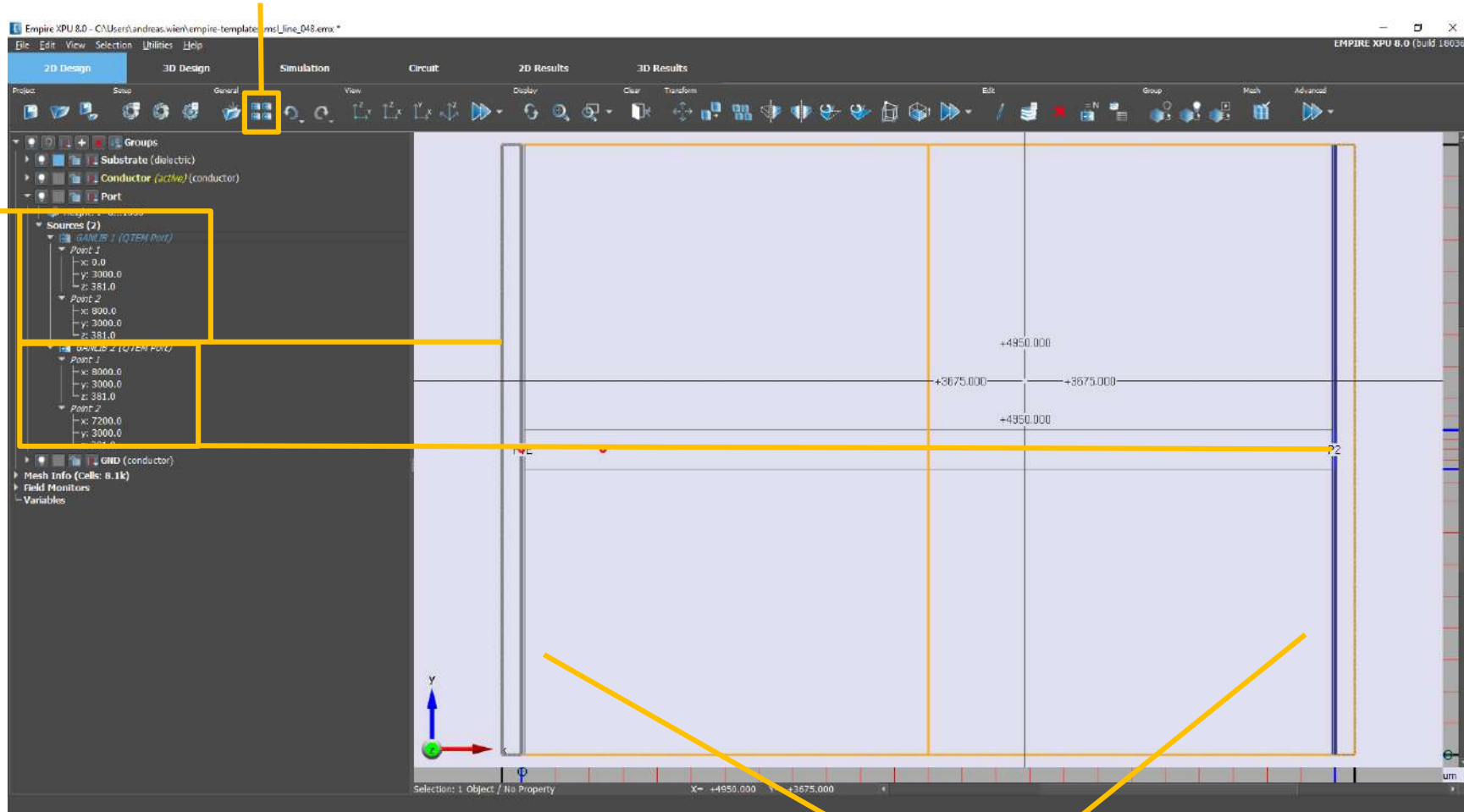
Selections

Handles

Sources

Port Wizard

Source coordinates and parameters



P1E: Excited QTEM port

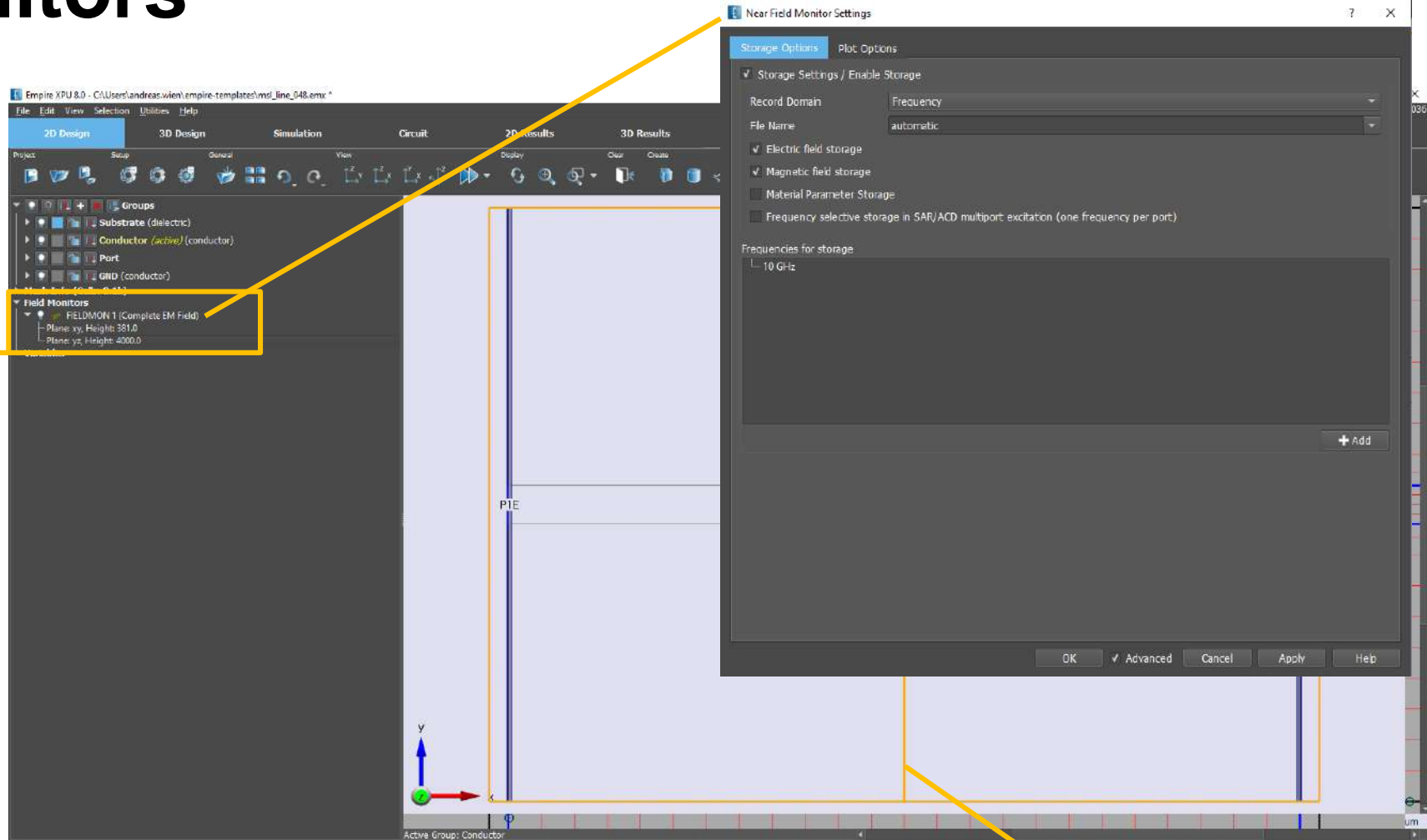
P2: non excited QTEM port

Steps:

- Open group Port, open Sources
- Left click on Element 1 in side menu to select
- Esc to deselect, Close list

Monitors

Field monitor parameters



Steps:

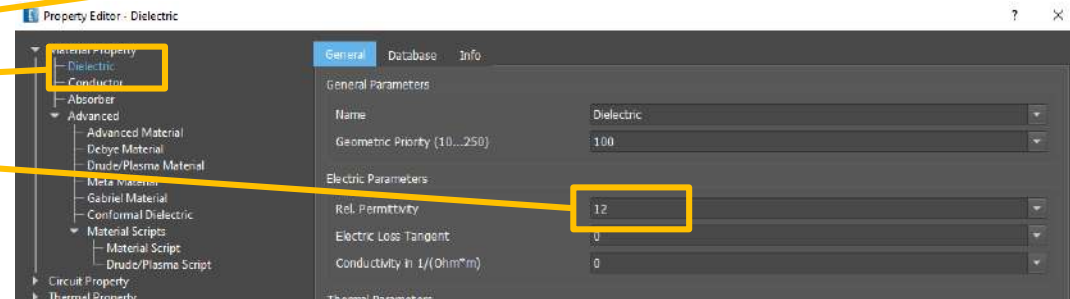
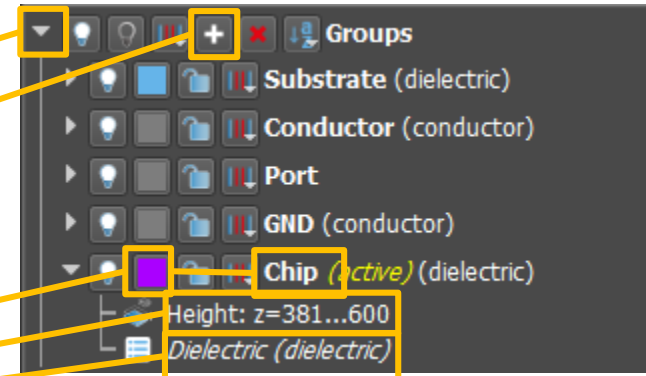
- Open Field Monitors
- Click on Light Bulb to hide visualization planes
- Double click on Field Monitor to edit settings
- OK, Close list

Visualization planes

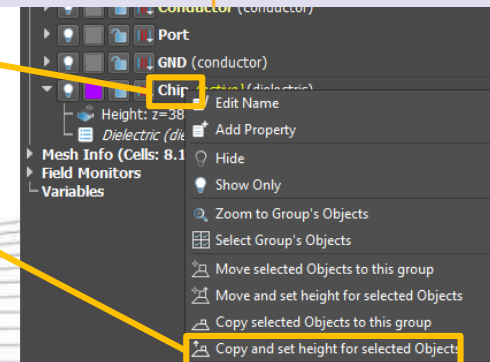
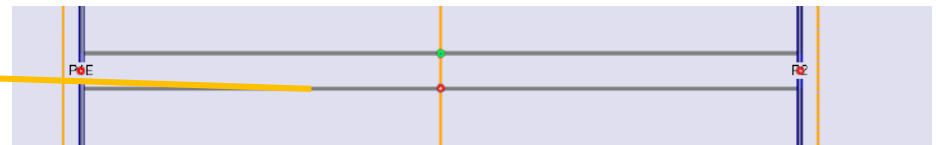
Working with Groups

Steps

- Open Group list
- Click Create group
- Edit Name (right click on name), recolor
- Double click Height z: 381...600
- Double click Property
- Set Dielectric
- Permittivity: 12
- OK



- Left click on center strip to select
- Right click on group Chip
- Select „Copy and set height...“
- Press Esc to deselect

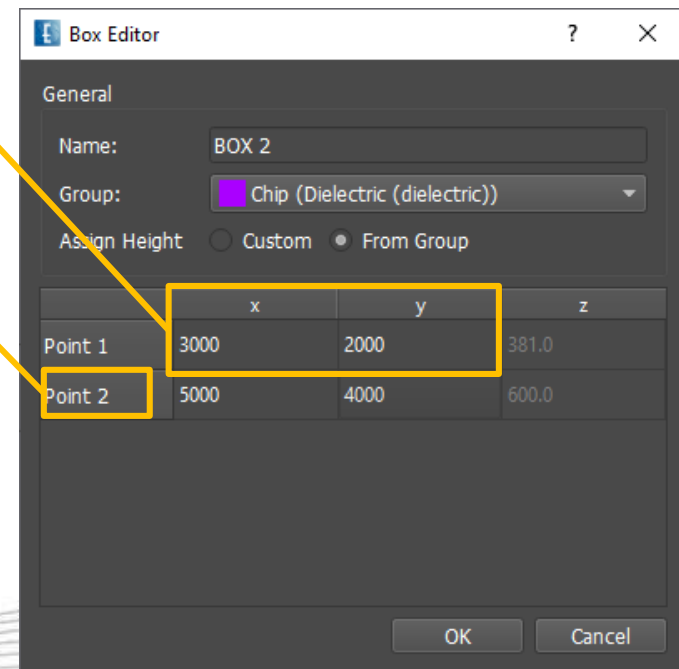
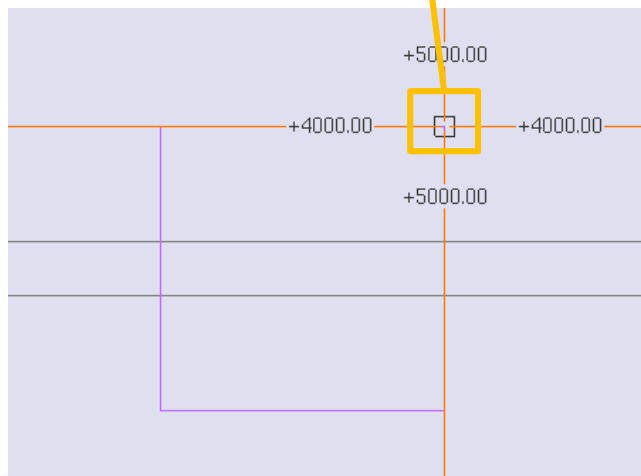
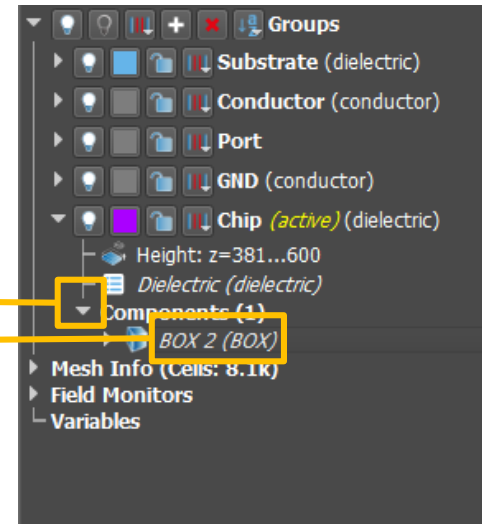


Hint:
Center strip is copied to new group using height of new group

Changing Objects

Steps

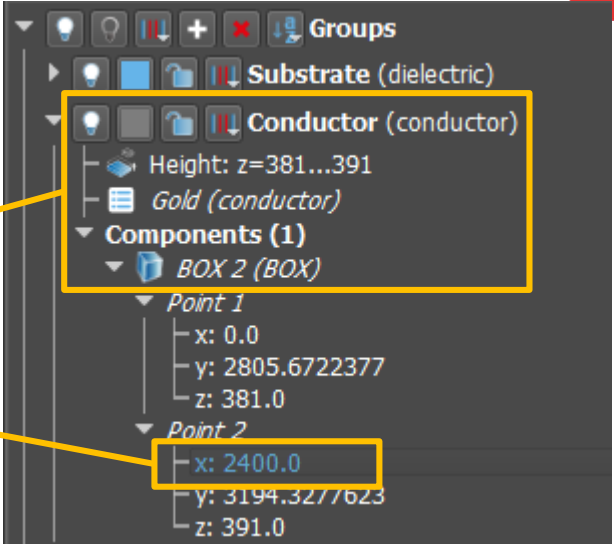
- Open Components
- Right click on BOX 2
- Select „Edit“
 - Overwrite coordinates $x=3000$, $y=2000$
 - Right click on „Point 2“
 - Select „Pick coordinate“
 - Move cursor to x,y coordinate
 - Click OK



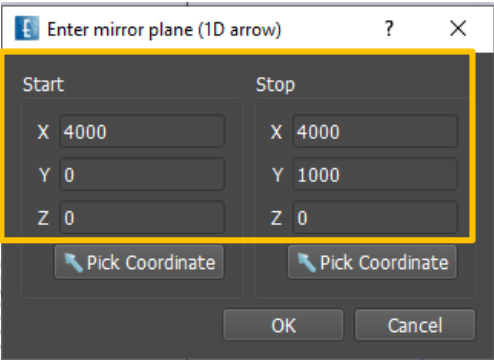
Changing Objects

Steps

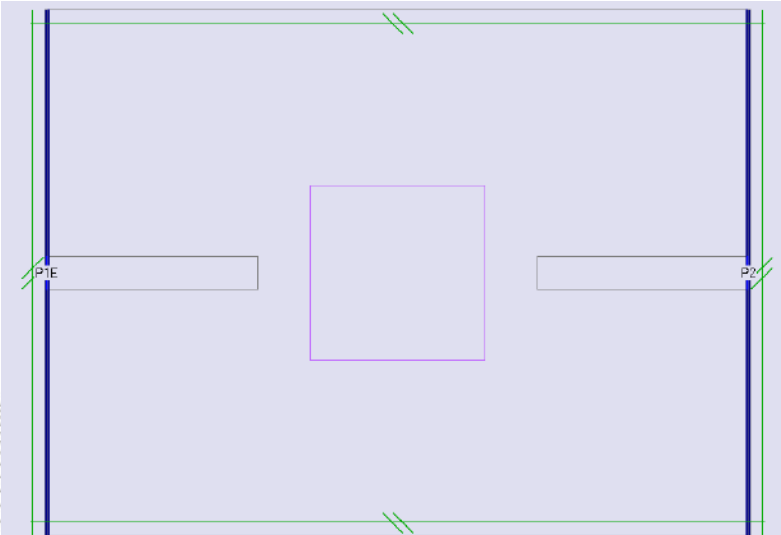
- Open Group Conductor – Components - Box 2
- Set Point 2: x = 2400
- Click on “Box 2”
- Click on “Copy Mirror”:



- Enter Mirror plane:



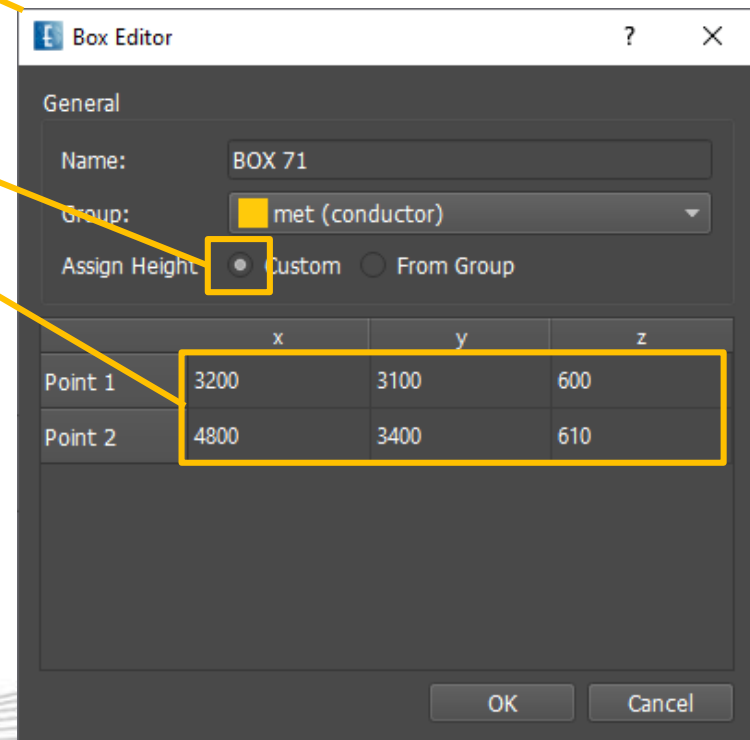
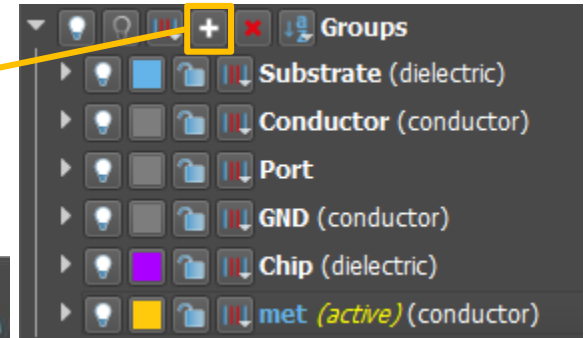
Result



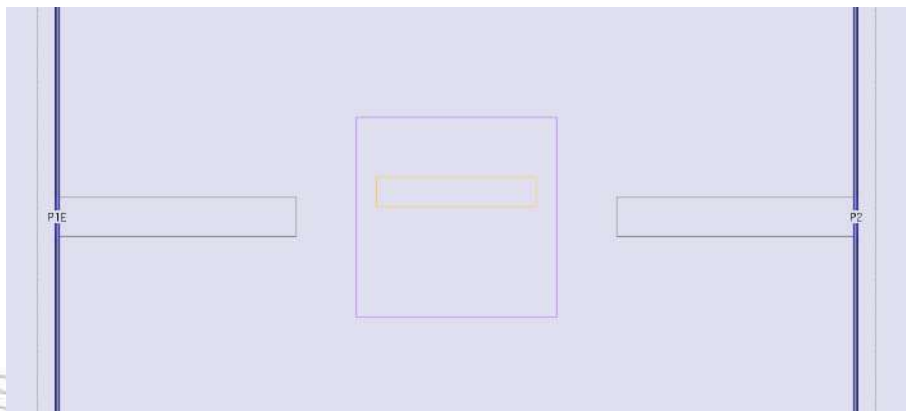
Creating basic objects

Steps

- Create new group
- Click Create Box
- Select „Custom“
- Overwrite coordinates
- Press Ok



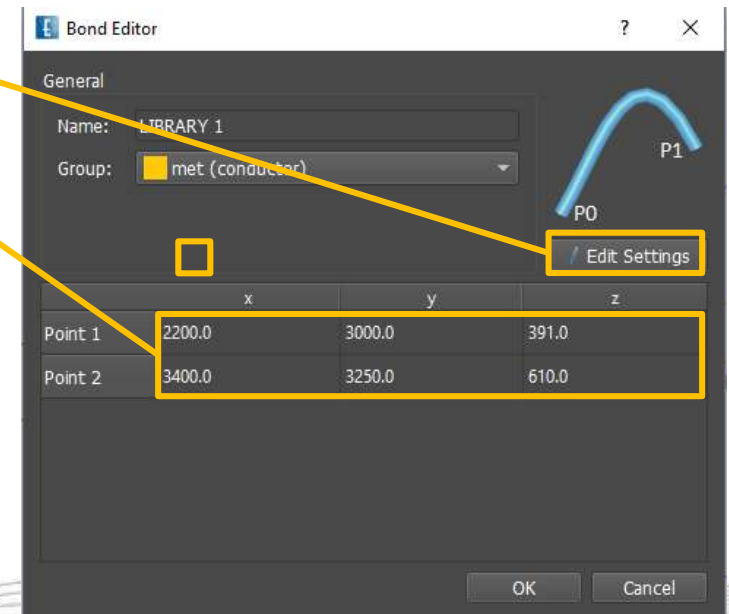
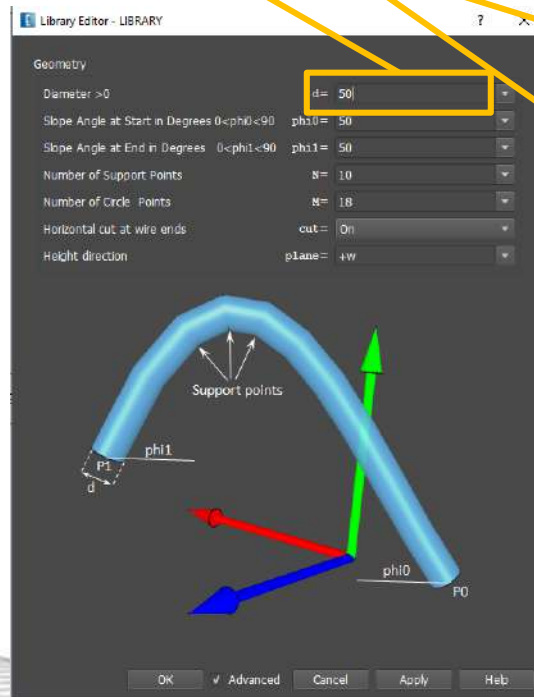
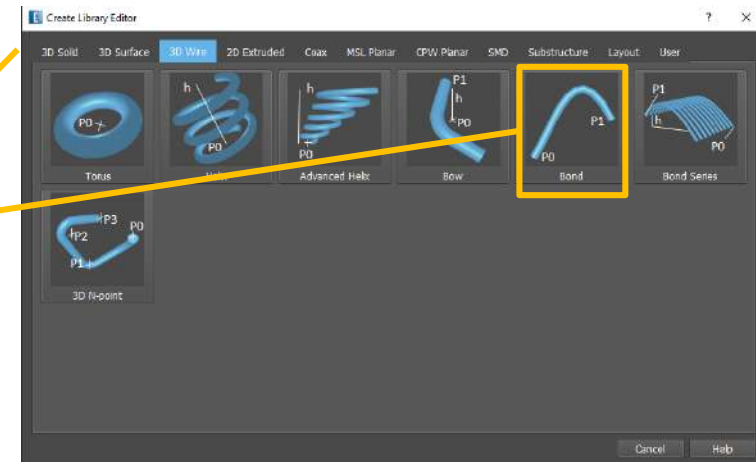
Result



Creating library objects

Steps

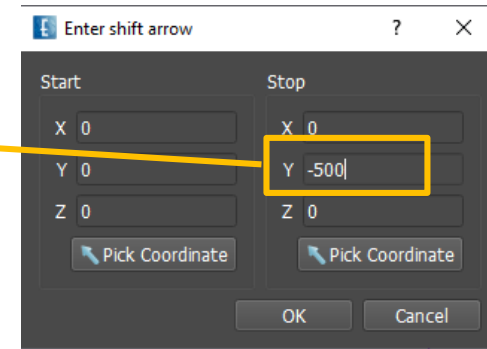
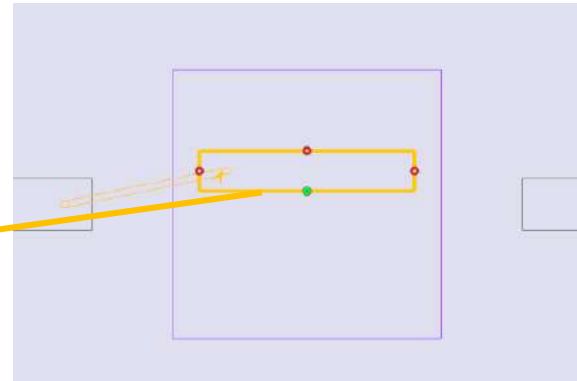
- Press Create Library Object
- Select 3D Wire – Bond
- Overwrite coordinates
- Click Edit Settings
- Enter Wire Diameter: 50
- Close



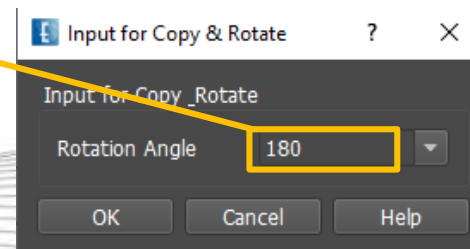
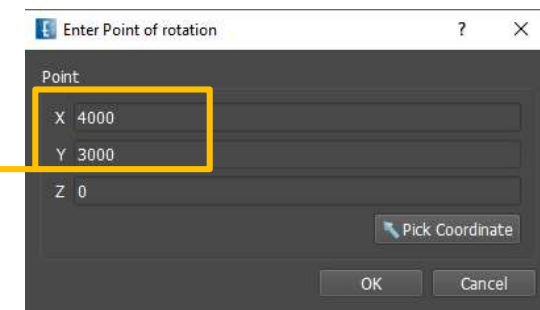
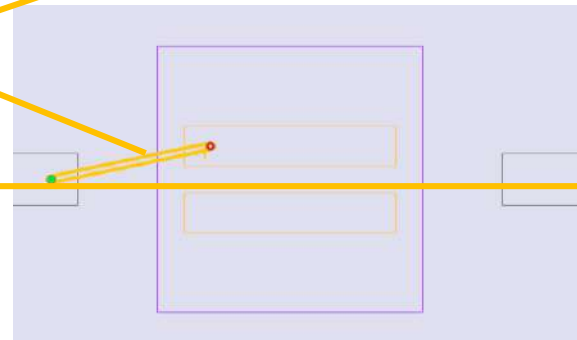
Operations

Steps

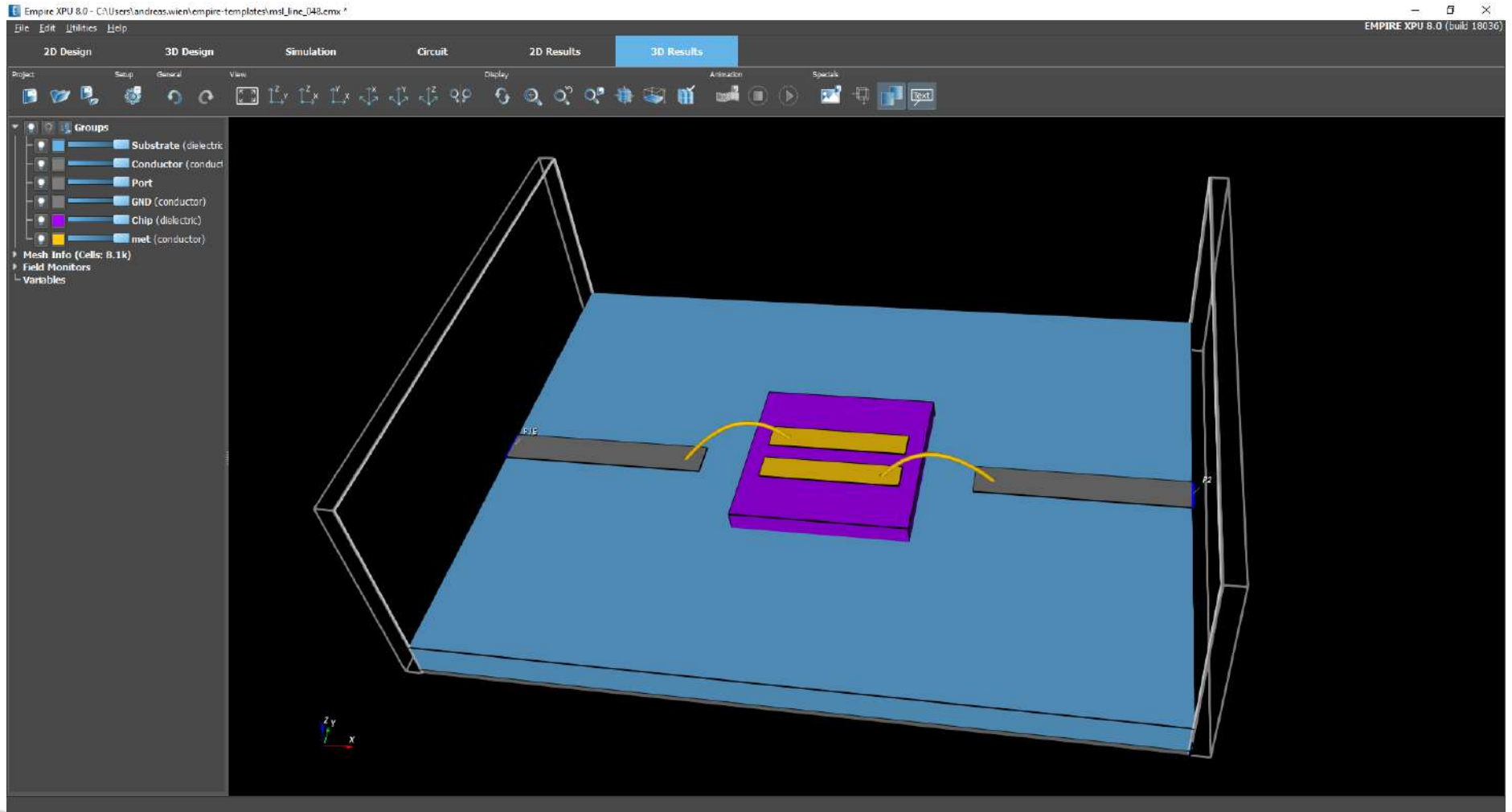
- Left click on strip
- Press Copy
- Enter $y1=-500$



- Left click on Bond Wire
- Press Copy & Rotate
- Enter $x=4000, y=3000$ as mirror axis point
- Enter 180 (degree) for rotation angle



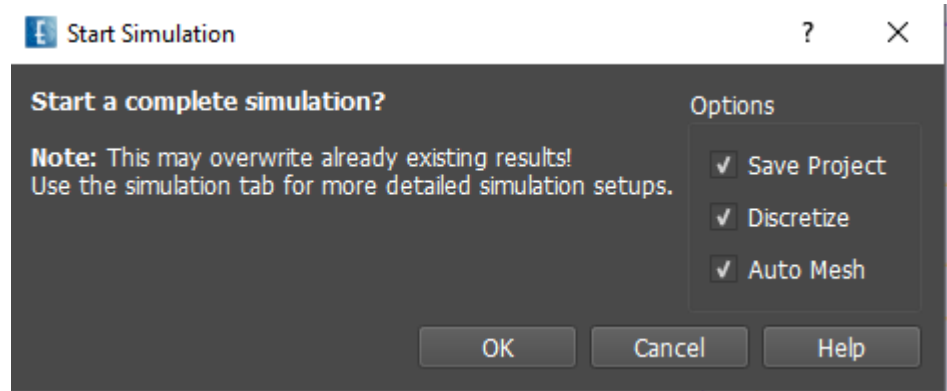
Model (3D Result Tab)



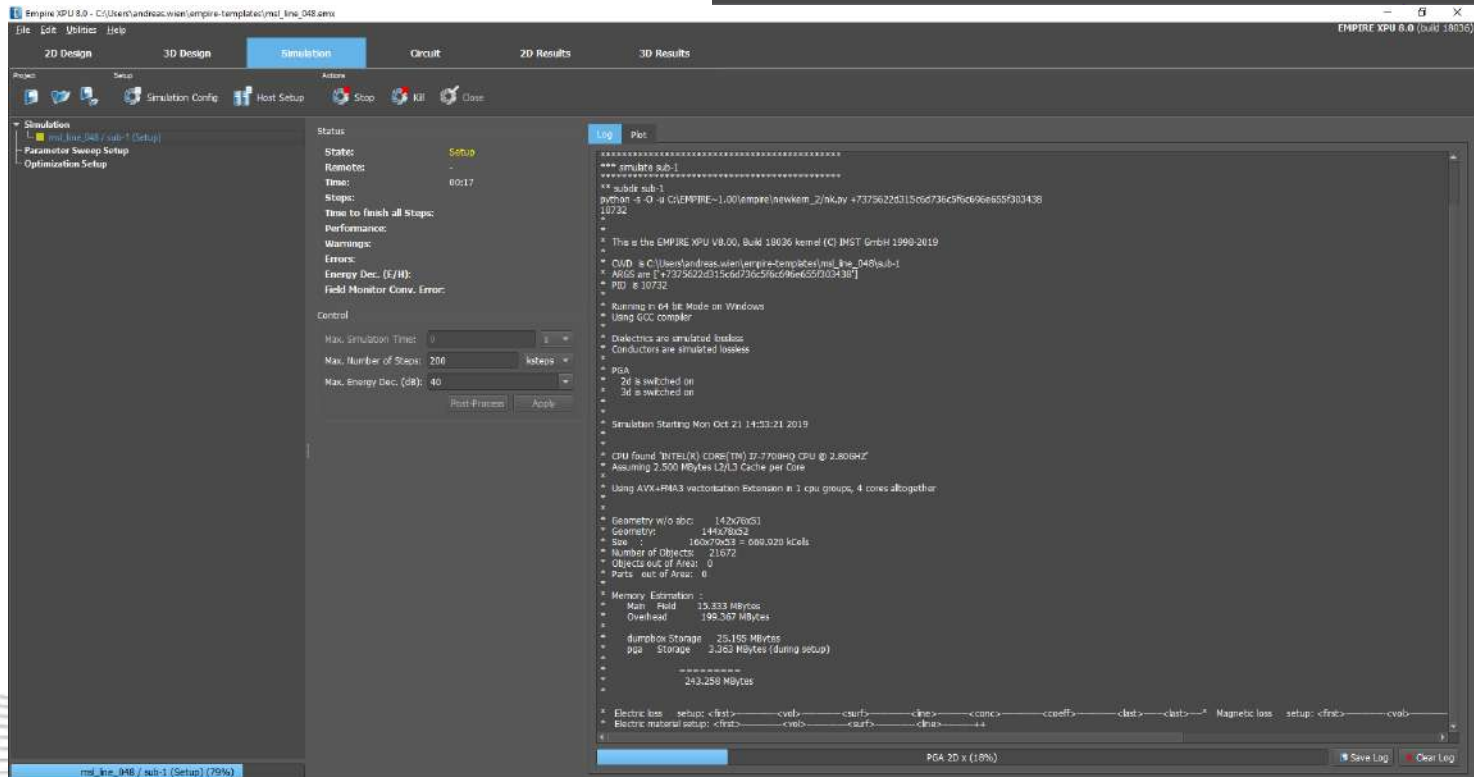
Simulation

Steps

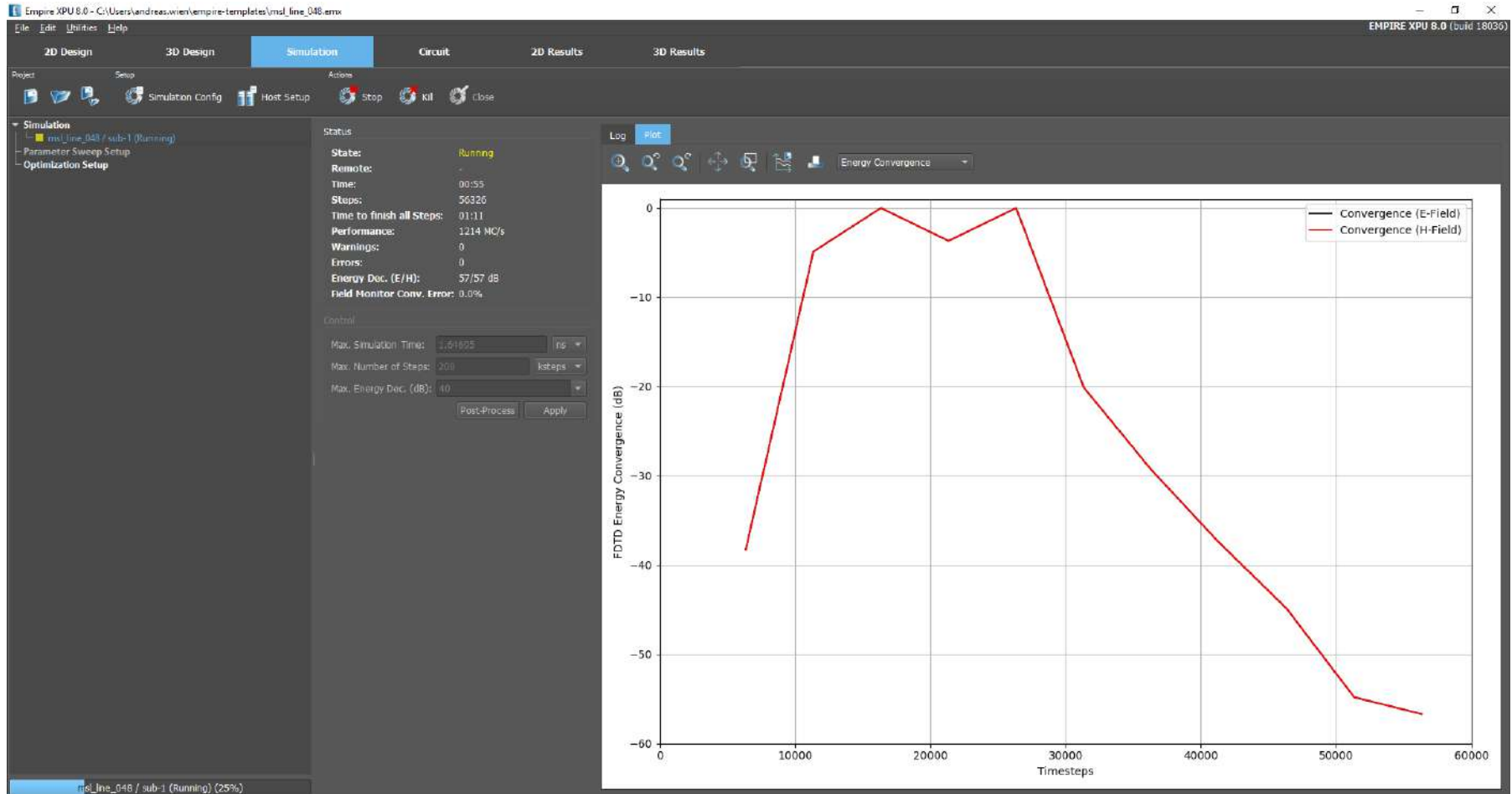
- Click Start Simulation
- Confirm OK



Compilation progress Log Window

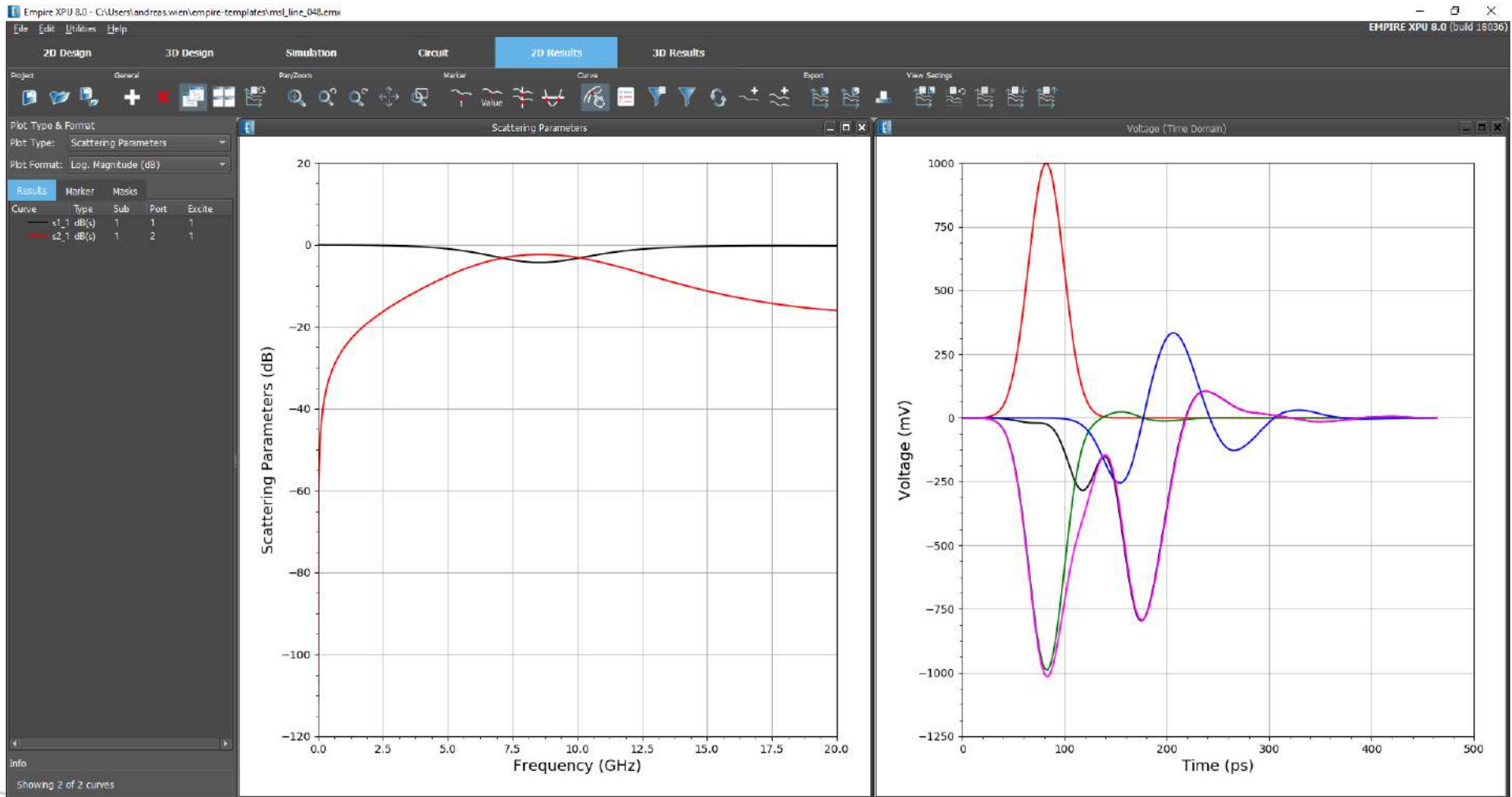


Running Simulation



Energy versus time

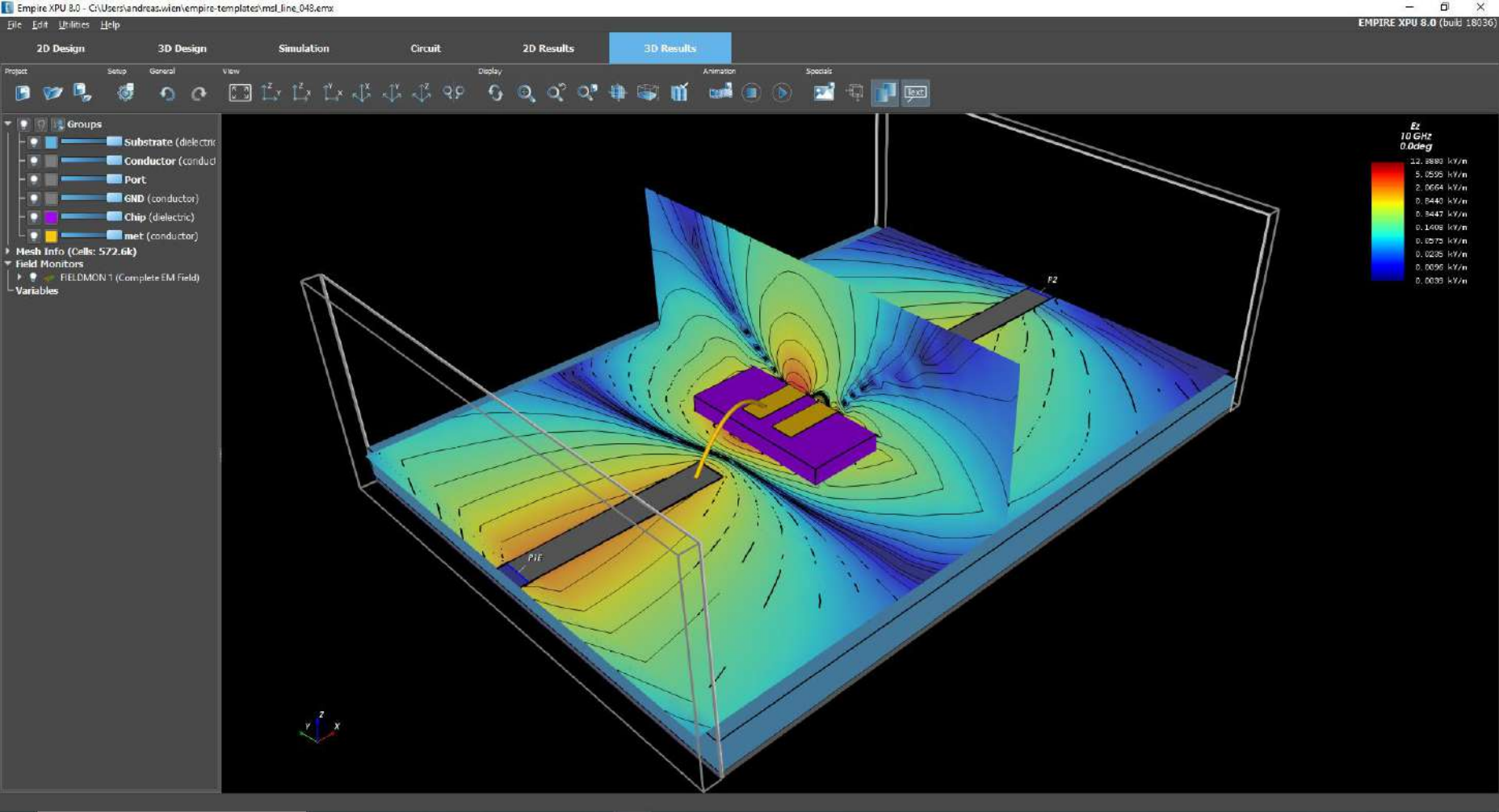
2D Result



Plot Type: S-parameters

Plot Type: Voltage (Time Domain)

3D Result



Electric field at 10 GHz in 2 planes