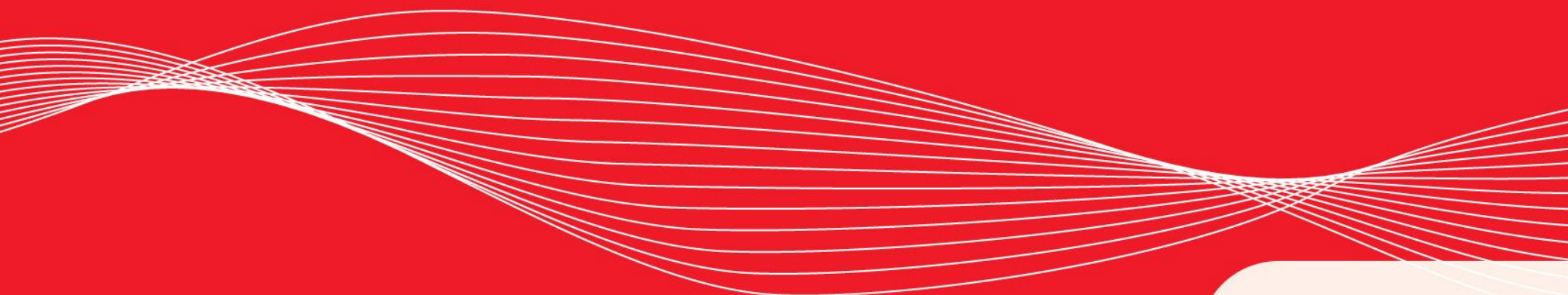


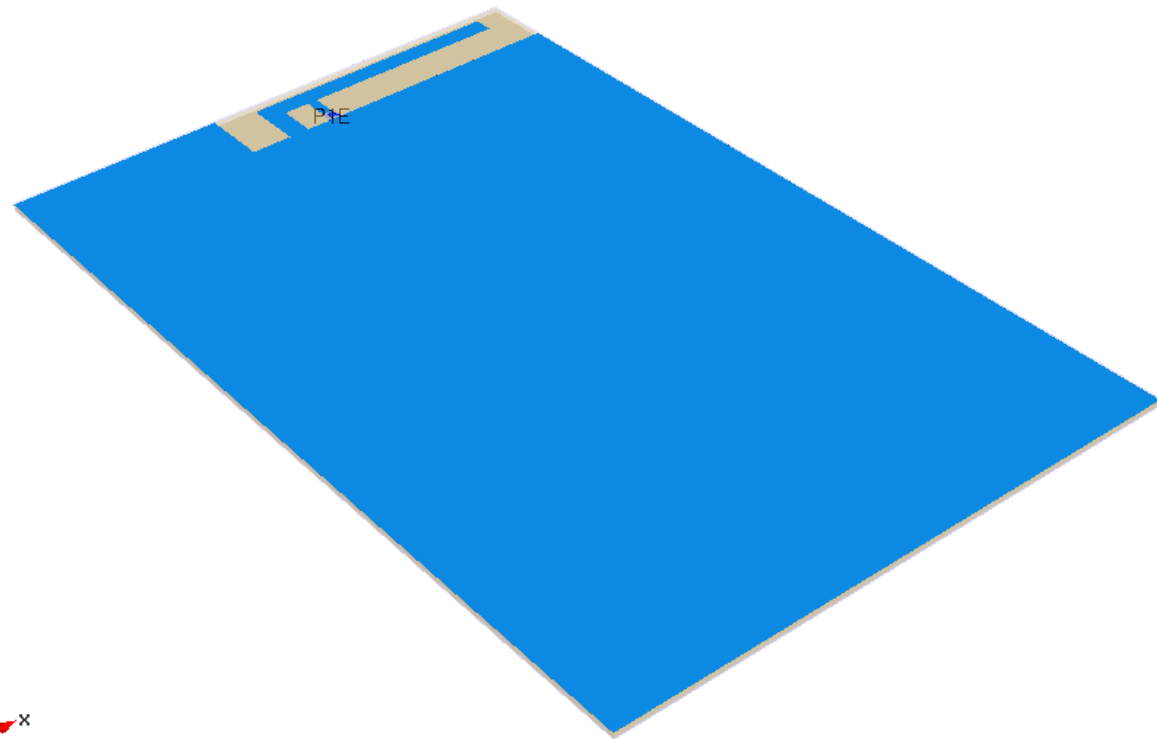
# EMPIRE XPU Tutorial

## Printed Inverted-F Antenna



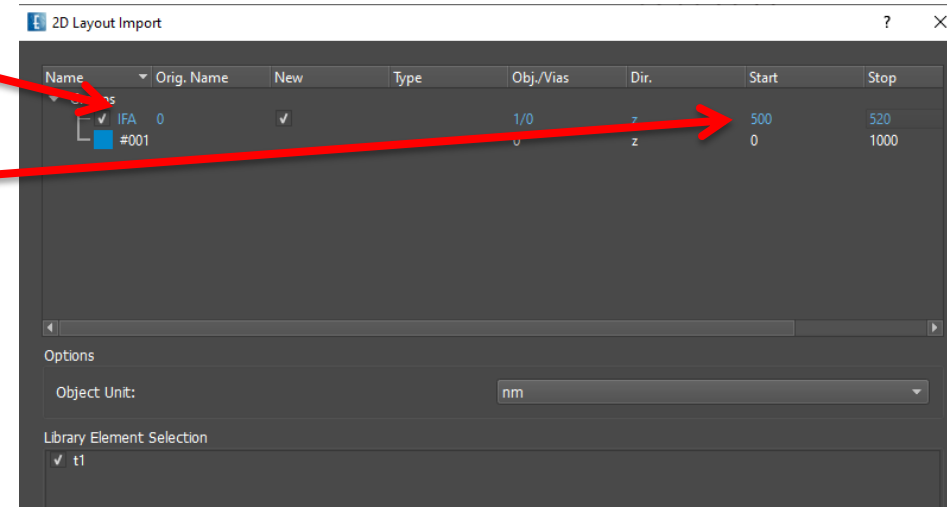
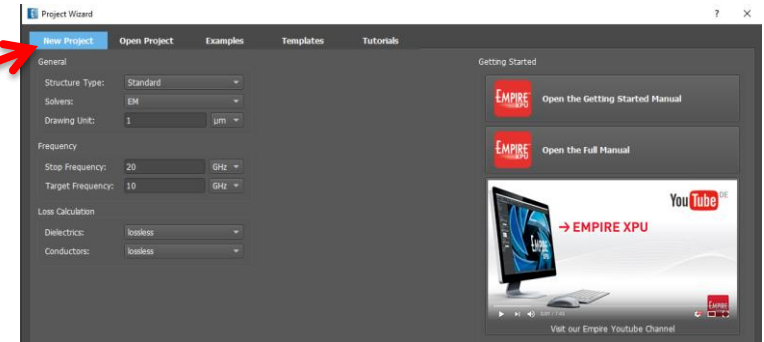
# Overview: Topics

- Start from Scratch
- GDS layout import
- Priority control
- In-plane lumped ports
- Near field dump
- Far field transformation
- Near field animation
- Far field animation



# Step 1: Import Layout

- Start EMPIRE XPU from Desktop
- Select “New Project”, OK
- Select File → Import → 2D Layout → GDSII
- Browse for “data/ifa.gds” \*\*
- Define the new group name to “IFA”
- Set Start to 500
- Set Stop to 520
- Click OK
- Select File → “Save As”
- Enter, e.g. “C:\tutorial\ifa”

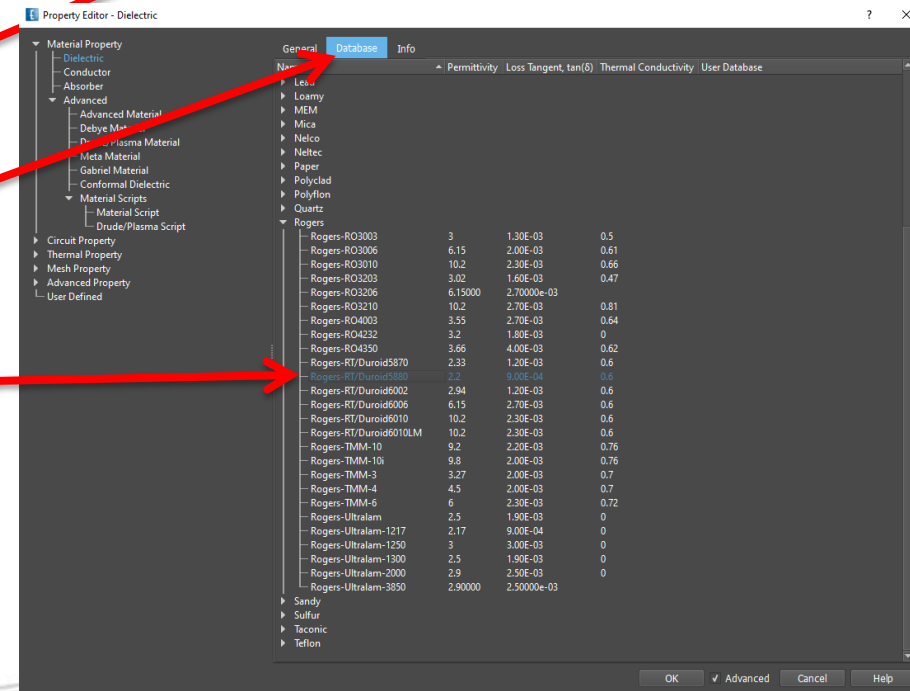
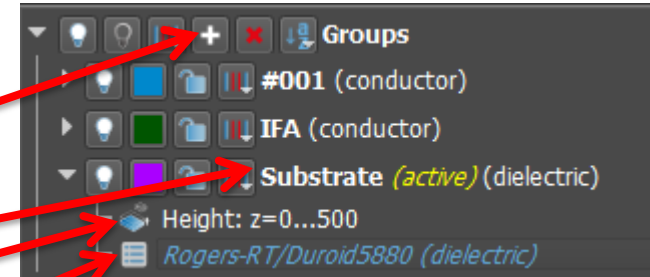


*\*Imported layouts are boxes or polygons and can be found in the group list after import for modification purposes.*


*\*\* C:\EMPIRE\_XPU\_8.00\Tutorials\2D Design\03 Inverted F Antenna\data*

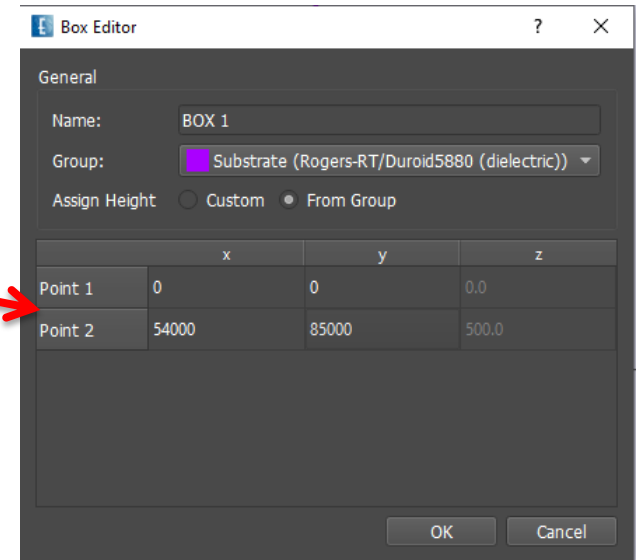
# Step 2: Substrate Definition

- Switch to “2D Design” Tab
- Open Groups, Click “Create Group”
- Change group name to “Substrate”
- Double click height: z=0...500
- Double click “Conductor” to change property
- Select Dielectric, select Database
- Select Rogers → Rogers –RT/Duroid5880
- Click OK to leave the property editor

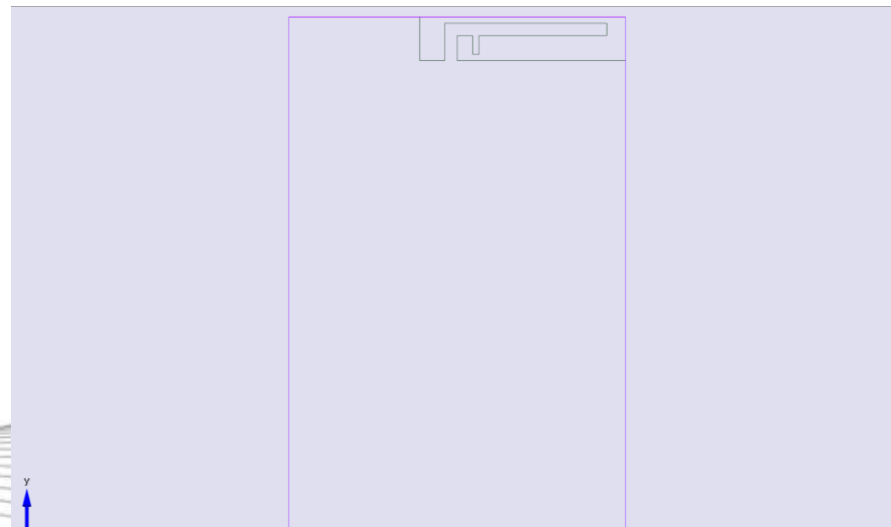


# Step 3: Object Creation

- Select Icon 'Create Box'
- Enter coordinates of Point 1: (0,0)
- Enter xy coordinates of Point 2: (54000, 85000)
- Click OK
- Press "Zoom Extents"  or press the Z-key

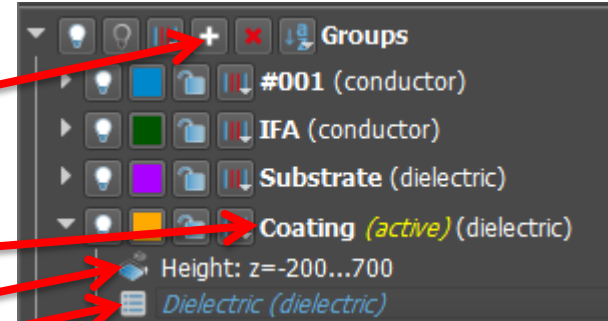


*Comments: The object is created immediately after pressing on Create – Box with the default values. The drawing is updated as soon as values are modified.*

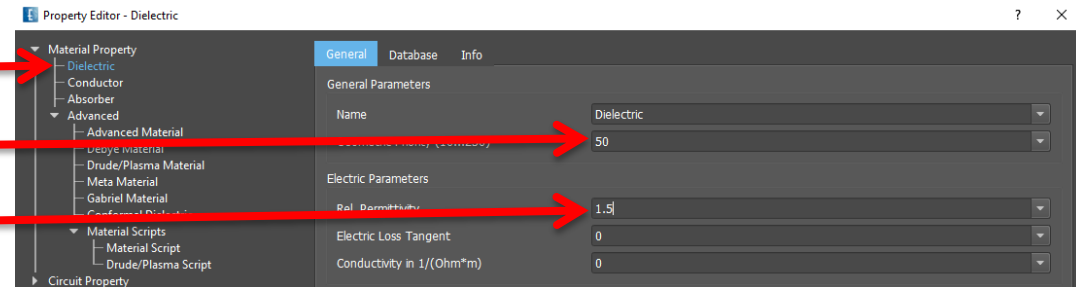


# Step 4: Coating

- Click “Create Group”
- Change name to “Coating”
- Double click “Height”: z=-200...700
- Double click “Conductor”
- Select “Dielectric”,



Geometric Priority 50\*  
 Enter Rel. Permittivity 1.5,  
 Exit with OK

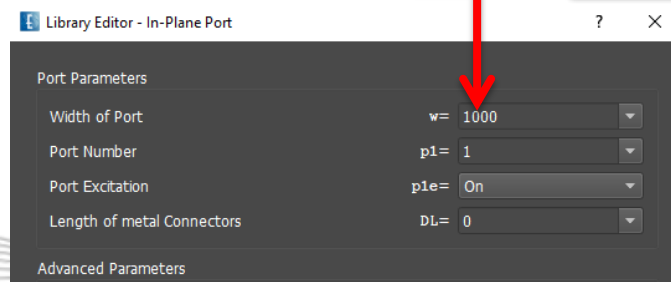
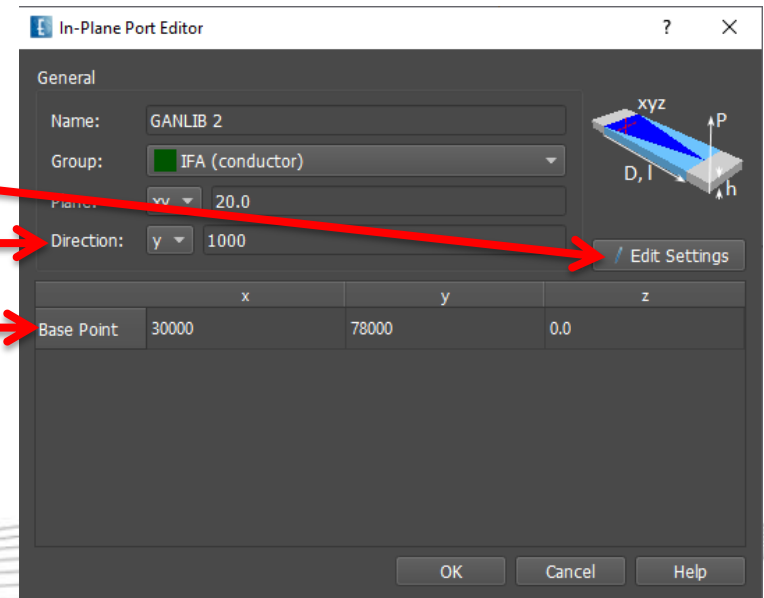
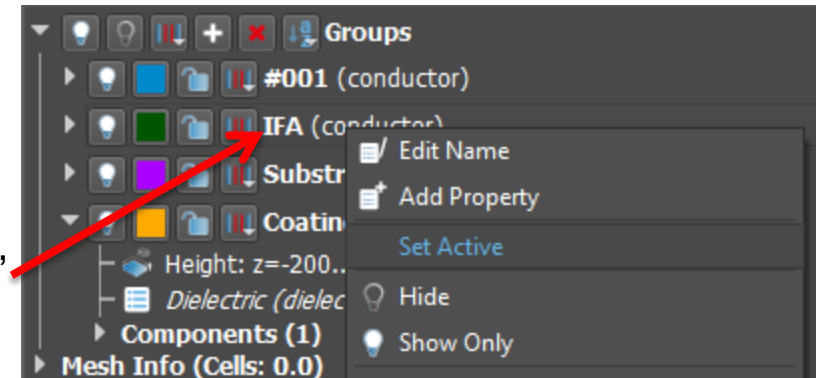


- Select Icon Create Box
- Point 1: x=0, y=0
- Point 2: x=54000, y=85000
- Click OK

*\* The priority number controls intersecting objects, e.g. substrate and coating: The object with the higher number remains in the intersecting area. Any number between 10 and 250 can be applied. More than 2 objects may be used. Defaults are 100 for dielectric, 200 for conductor.*

# Step 5: Port definition

- Right click on group name "IFA", select "Set Active"
- Select Icon "Create Source"
- Choose "Lumped" - 'In-Plane Port'
- Change Direction to y: 1000
- Base Point: x=30000, y=78000
- Click "Edit Settings"
- Enter "Width of Port" w=1000
- Close windows with OK

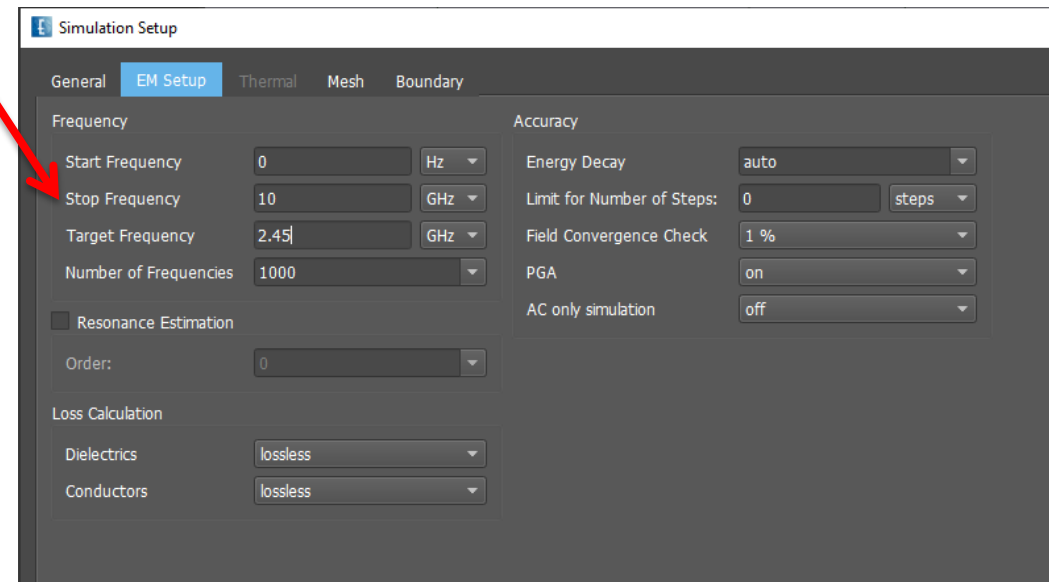


# Step 6: Simulation Setup

- Open Simulation Setup
- Select EM Setup tab



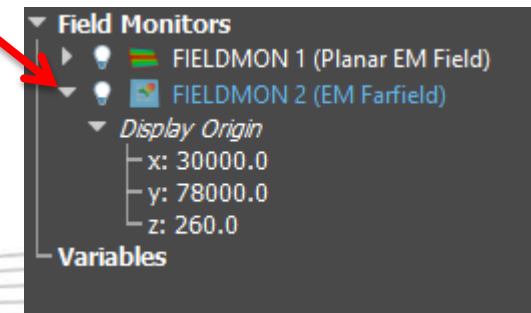
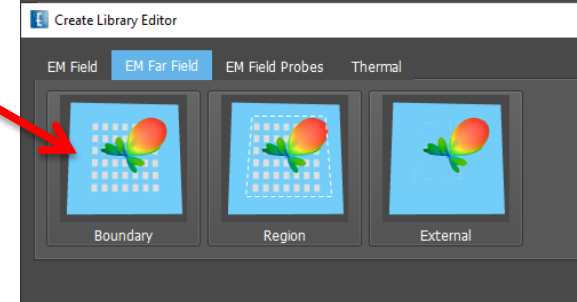
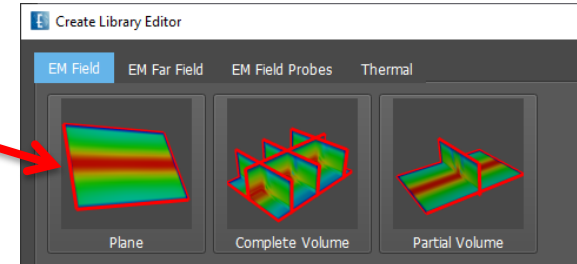
- Set Stop Frequency to 10 GHz,
- Set Target Frequency to 2.45 GHz
- 
- Close Window





# Step 7: Field recording

- Click “Create Field Monitors ”  
→ Tab: “EM Field” → “Plane”
- OK
- Click “Create Field Monitors ”  
→ Tab: “EM Far Field” → “Boundary”
- OK
- Open Field Monitor (EM Farfield)
- Set Display Origin to  $x=30000$ ,  $y=78000$ ,  $z=260$

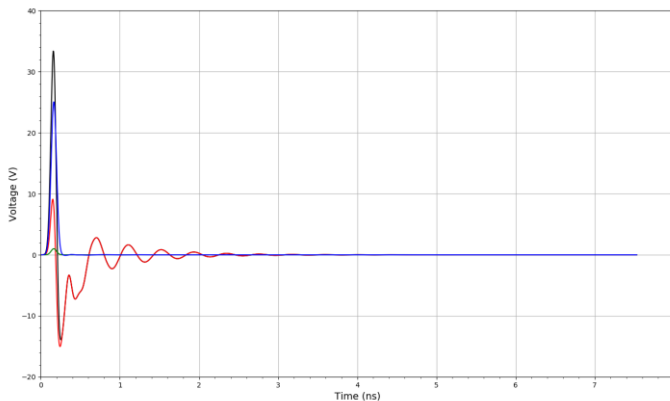


*Field monitors (right click to edit):*

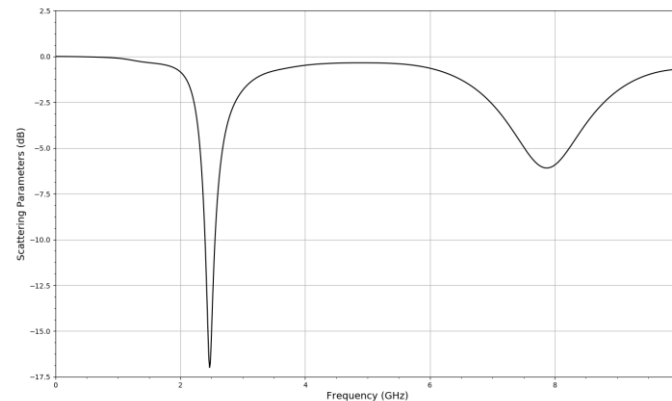
- 3D Plot options can be set after simulation and postprocessing
- Display Origin used as center for 3D pattern visualization
- Far field setups can be set after simulation, only new post processing is necessary
- The predefined calculations in the Far field monitor define 3 far field postprocessings
  - Far Field Setup 1 ( $\phi=0$ -cut plane)
  - Far Field Setup 2 ( $\phi=90$ -cut plane)
  - Far Field Setup 3 (3D pattern)

# Step 8: Simulation & Results

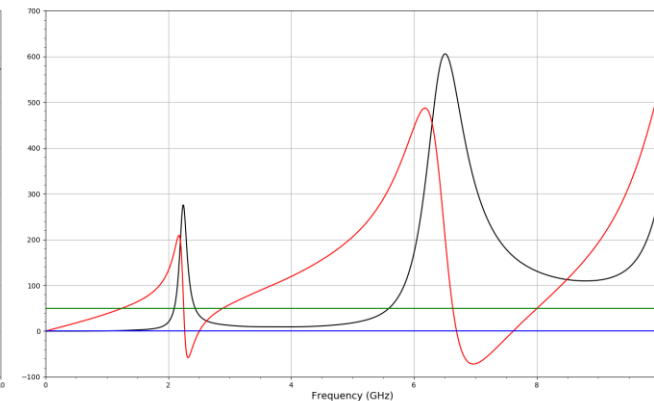
- Press 'Start Simulation'
- Confirm OK
- After the simulation (State: "Finished") switch to the "2D Results" tab



Plot Type: Voltage (Time Domain)



S-Parameters (S1\_1)



Impedance (Z1.in)

# Step 9: Animation

- Switch to “3D Result“ Tab
- Open Field Monitor
- *Optionally switch off/on monitors for display (light bulb)*
- *Optionally, right click – Edit to modify Plot Options*

