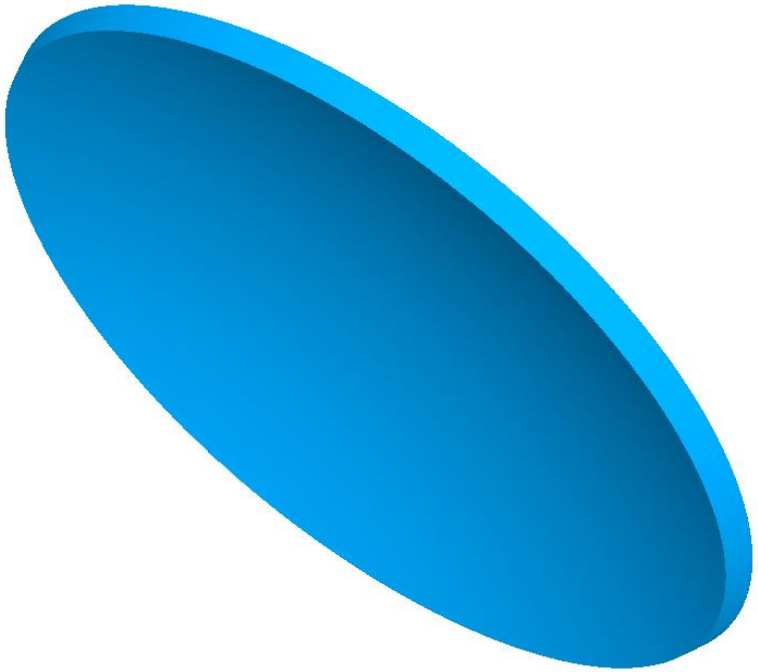
EMPIRE XPU Tutorial

3D Design - Reflector with Feed

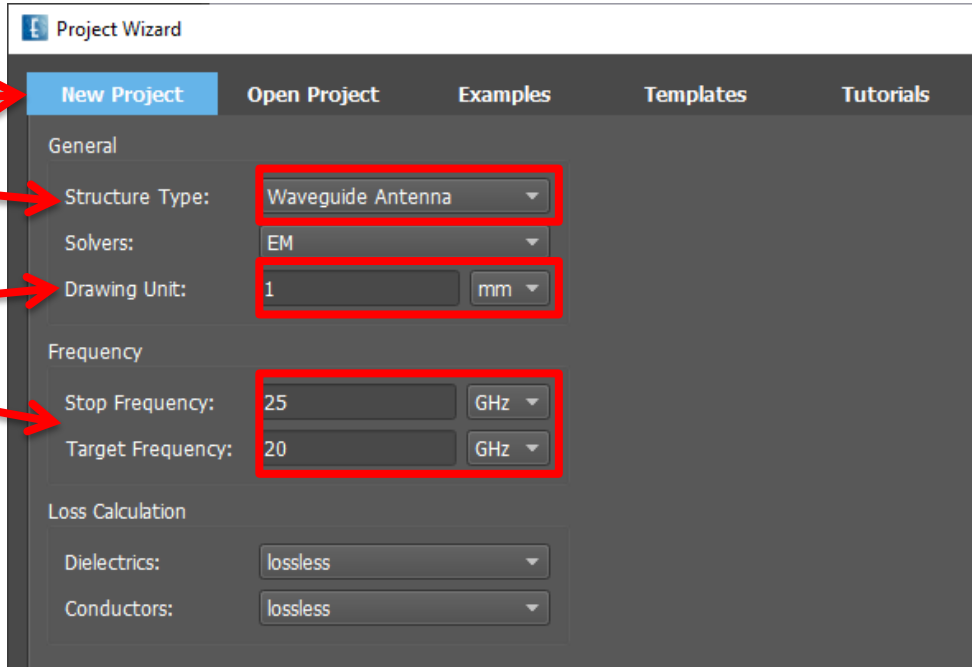
Overview: Topics

- Parabolic dish
- Waveguide port
- Support post
- Far field
- Near field



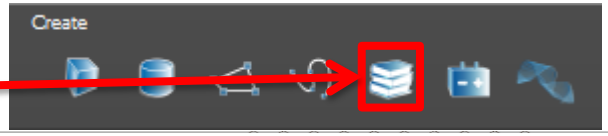
Step 1: Set Simulation Parameters

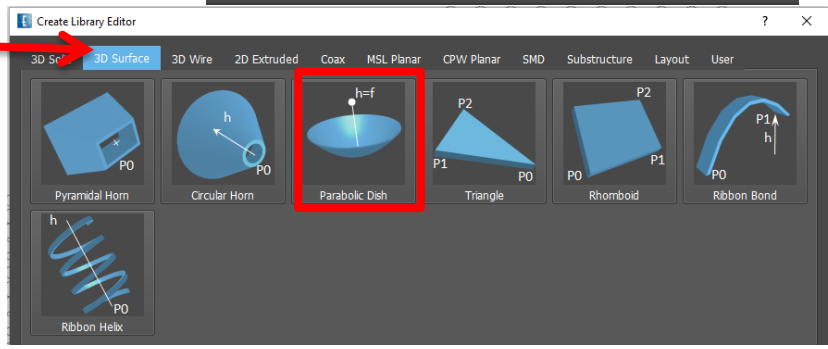
- Start EMPIRE XPU from Desktop
- Select “New Project” tab
- Set “Structure Type” = Waveguide Antenna
- Set „Drawing Unit“ = 1mm
- Set “Stop frequency” = 25 GHz,
  “Target frequency” = 20 GHz,
- Click OK
- Save project in a new folder

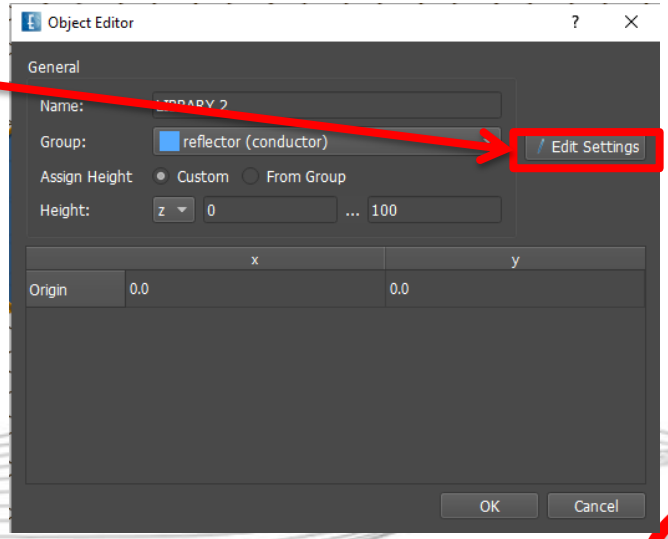


Step 2: Reflector Definition

- Right click on “#001”, Edit Name: “reflector”
- Click „Create Library Object“, select „3D Surface“ Tab, click „Parabolic Dish“
- Center Point: Move cursor to origin 0,0,0, left click
- Radius : r=75 (zoom out, move cursor –x to snap even coordinates)
- Focal distance: dw=100 (zoom out, move cursor +z)
- Click „Edit Settings“
- Set horizontal resolution vres=1, Thickness t=1,
- OK, Zoom Extents

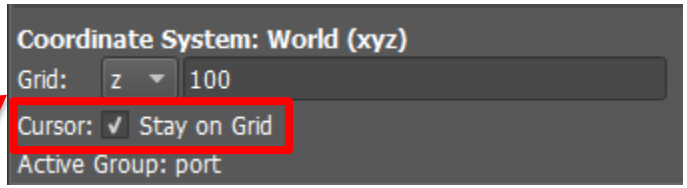






Comment:
** Use „Wheel backward“ to zoom out and ↑ to pan to access value with cursor*
The point defines the center and the height specifies the focus of the dish

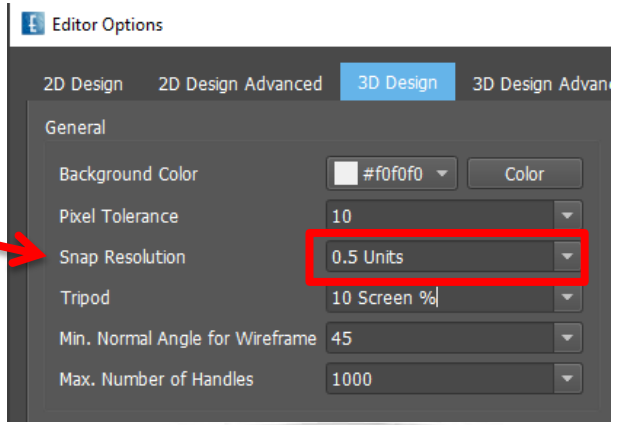
Step 3: Define Waveguide Port



- Create new group
- Rename to “port”, change color

- Set Grid “z=100”
- Enable „Stay on Grid“ snap mode

- Open editor options
- Tab 3D Design: Set Snap resolution to „0.5 Units“
- Close window

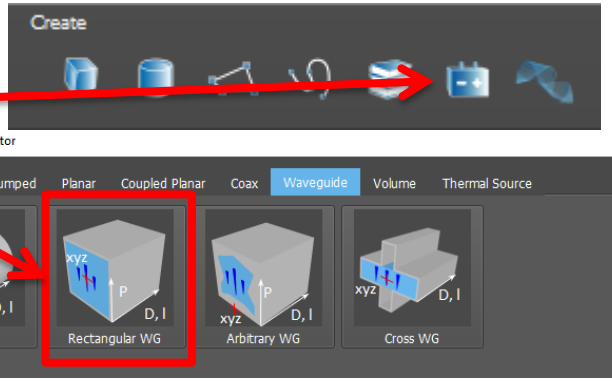


- Switch to top view  , zoom in

*Comment: The **stay on grid snap mode** forces snap points to be always on the grid (and not on objects below / above the grid)*

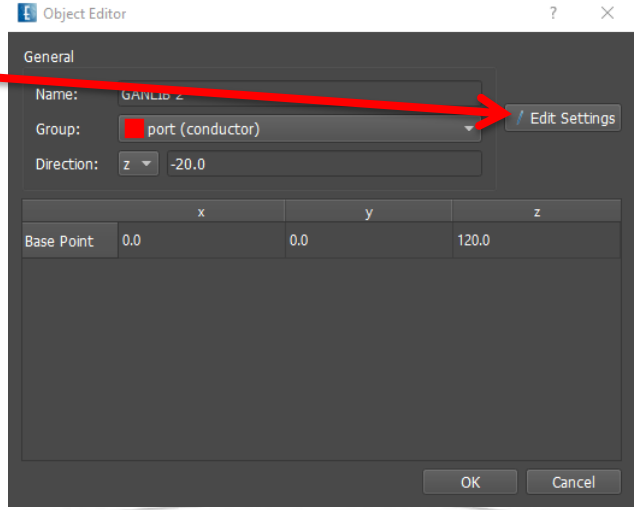
Step 4: Define Waveguide Port

- Click ‘Create Source’ ,
  switch to “Waveguide” tab, select ‘Rectangular WG’



- First Point: Click at x=-5, y=-2.5,z=100
- Second Point: Click at x=+5,y=+2.5,z=100
- Rotate (e.g. drag right mouse to the top)
- Height (z-position)*: Click at z=120

- Click “Edit Settings”

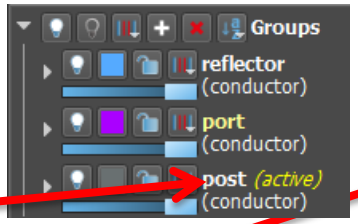


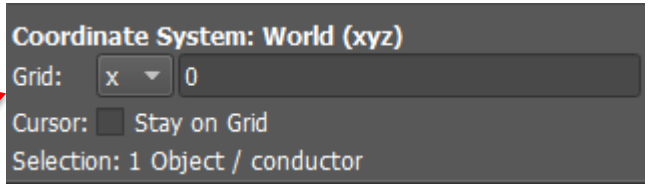
- Verify width Width=10,
  Height=5
  Correct if needed
- Close window

- Switch to iso-z view, zoom extents

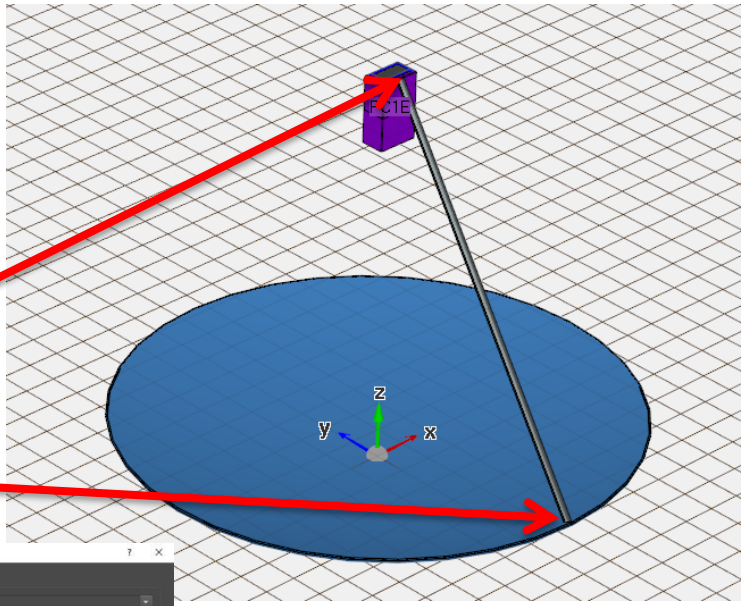
*Comment: *Use „up“ key ↑ to access z=120*

Step 5: Support Post

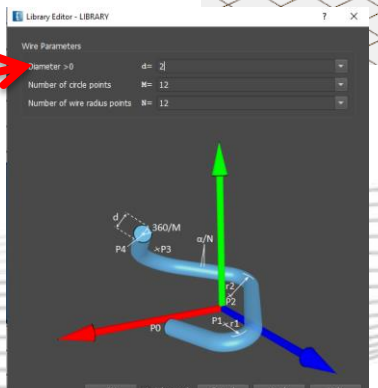




- Create new group
- Rename to “post”, change color
- Set Grid “x=0”
- Uncheck “Stay on grid”



- Click “Create Library Object”, Tab 3D Wire
- Select “3D N-Point”, zoom to port
- First Point:
  Move cursor to 0,-3.5,120, left click 2x*
- Second Point:
  Move cursor to 0, -75, 14.xxx, left click 2x
- Long left click to finish



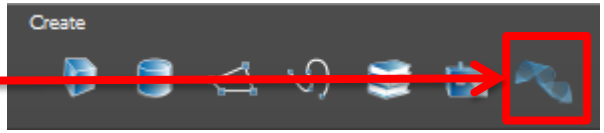
- Click “Edit Settings”, set diameter d=2

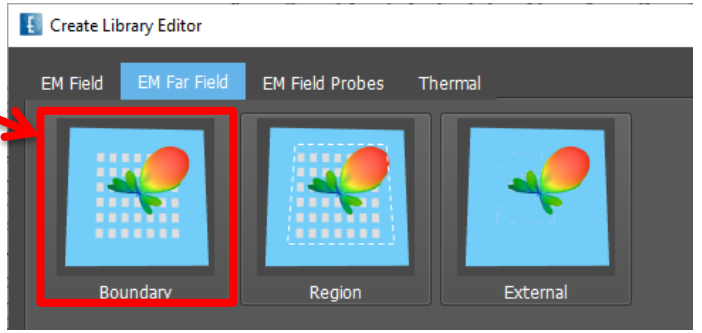
Comment: 2x left click on same position to confirm height du = 0

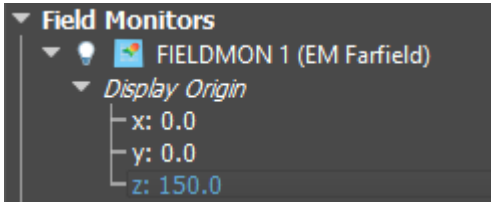
Step 6: Far Field setup

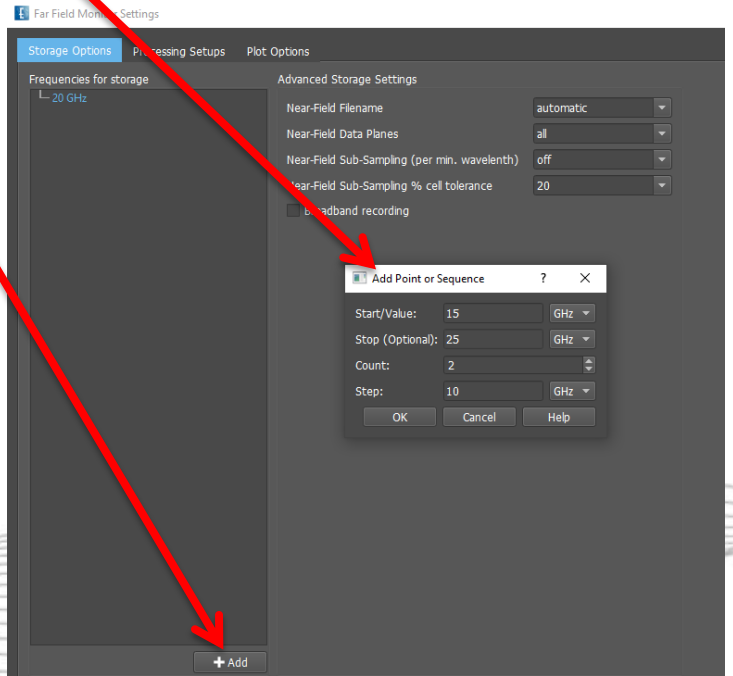
- Click “Create Field Monitors”
- Create new EM Far Field - Boundary
- Click „Add“ button
- Add Frequency points for 15e9, 25e9
- Close with OK

- Open Field Monitors
- Set Display origin z=150







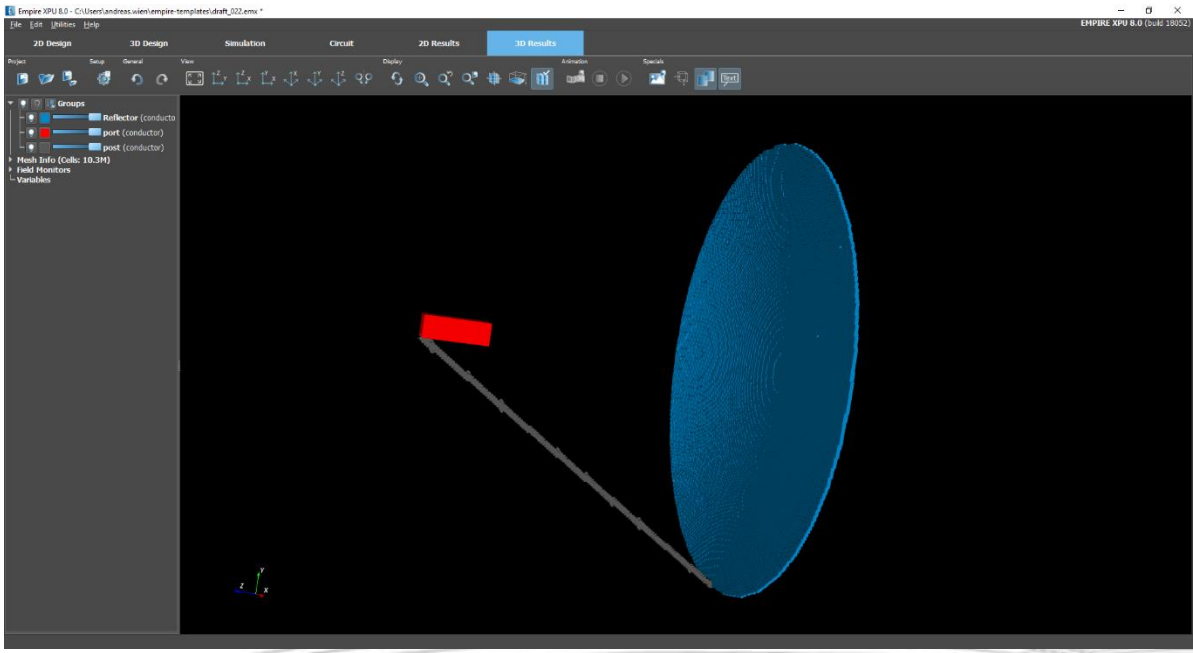


Comment: The defined display origin point defines the origin of the 3D Farfield pattern display

Step 7: Mesh

- Click “Create Mesh”
- Click “Meshed 3D Structure”

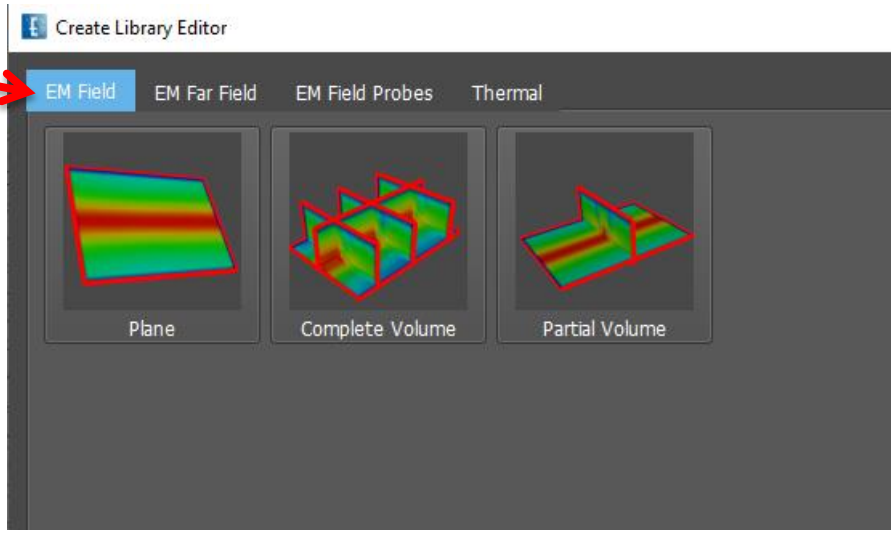
  to check the meshed model of the reflector and feed*
- Click 3D Design to return to regular view

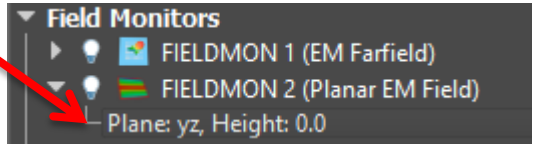


*Comment: * This switches to the 3D Display mode*

Step 8: Near Field Setup

- Click “Create Field Monitor”
- Keep default frequency
- OK
- Open FIELDMON 2 (Planar EM Field)
- Double Click “Plane”
  set plane to yz at x=0

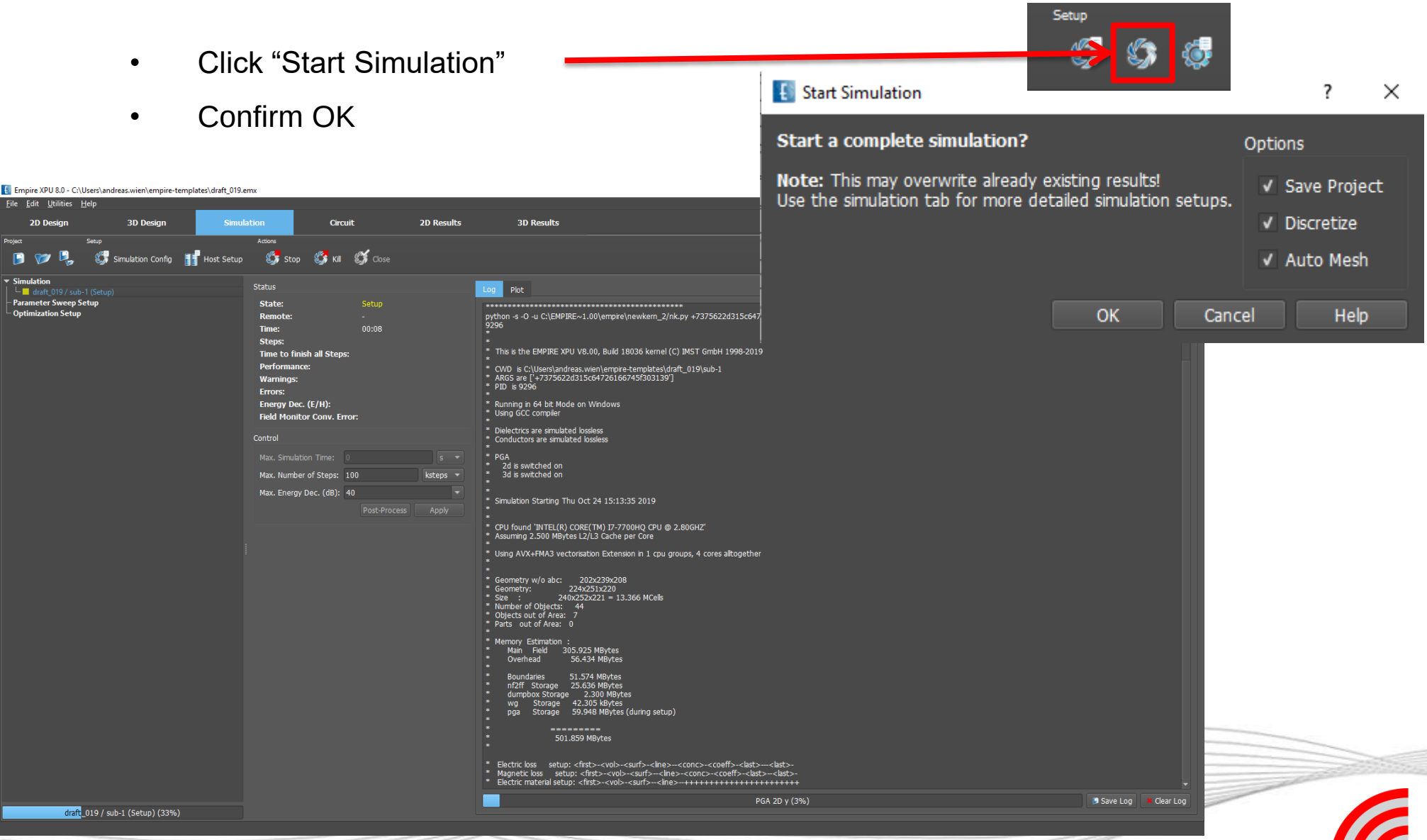




Comments:
- *The Near Field will be stored at the previously set target frequency (step 1, 20 GHz).*

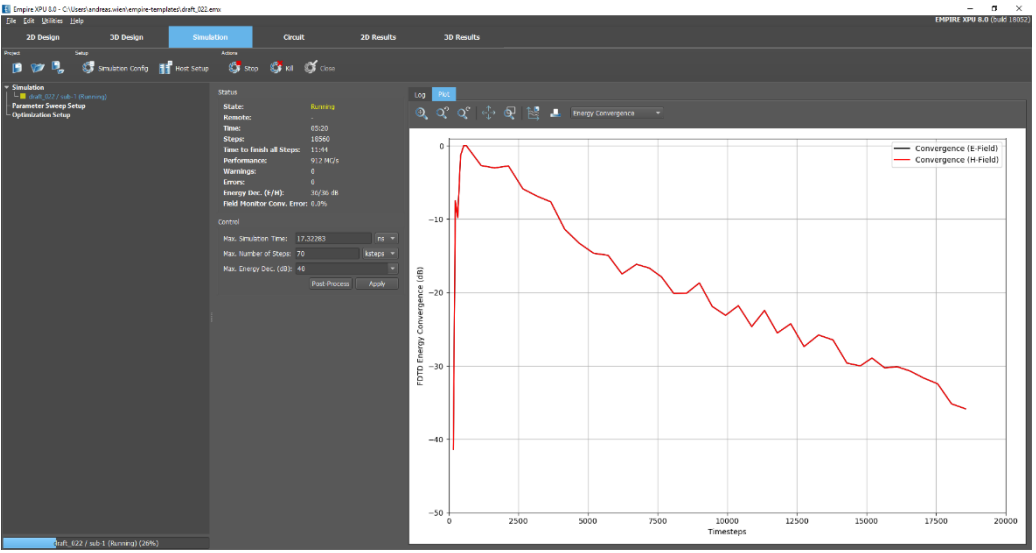
Step 9: Simulation

- Click “Start Simulation”
- Confirm OK

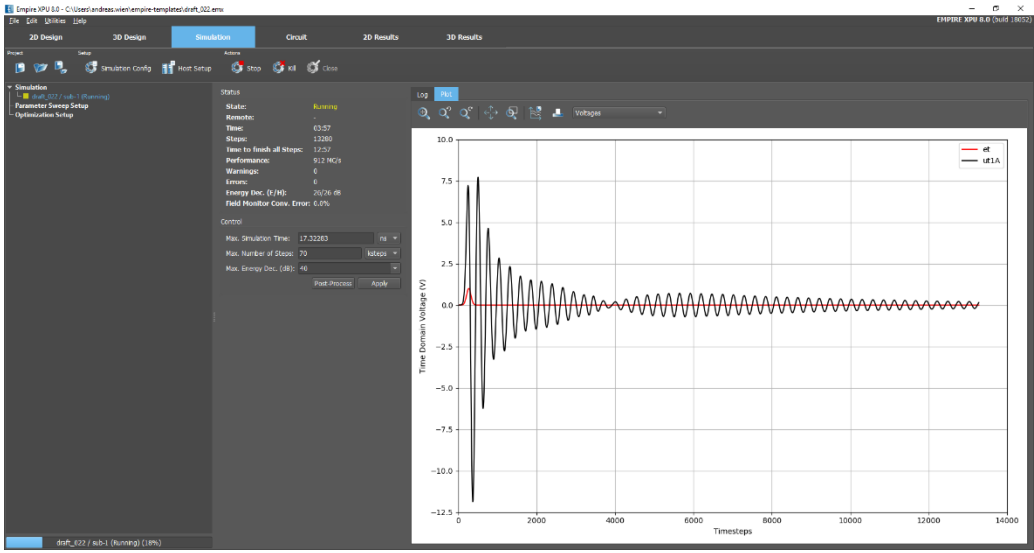


Step 10: TD monitor

Energy vs. time

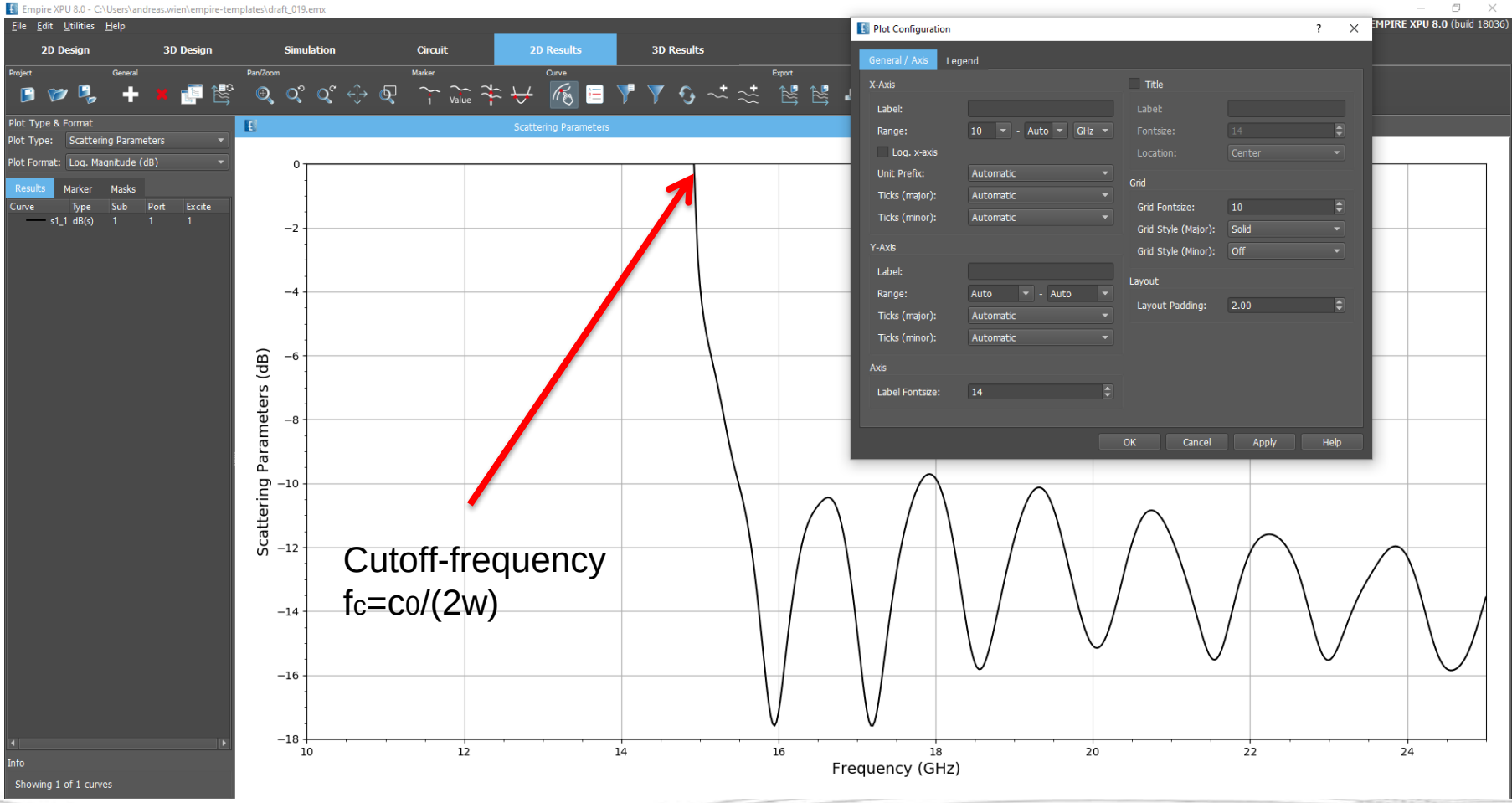


Voltage vs. time



Step 11: S-Parameter

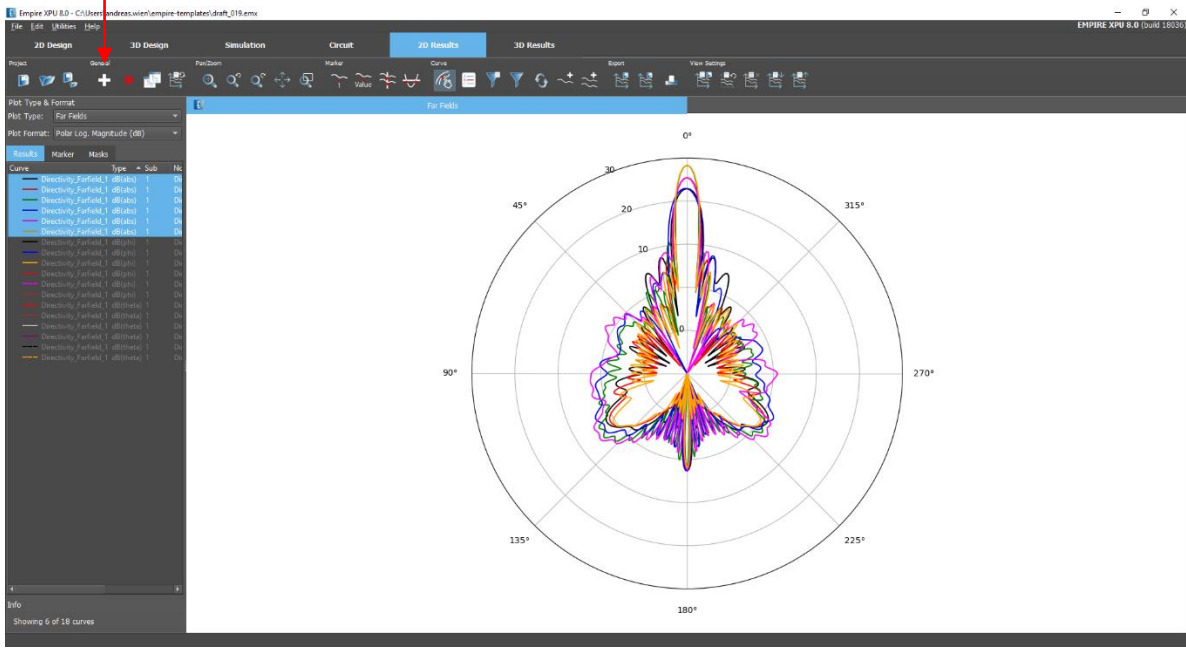
- Switch to 2D Results tab, right click for plot configuration



Step 12: Far Field

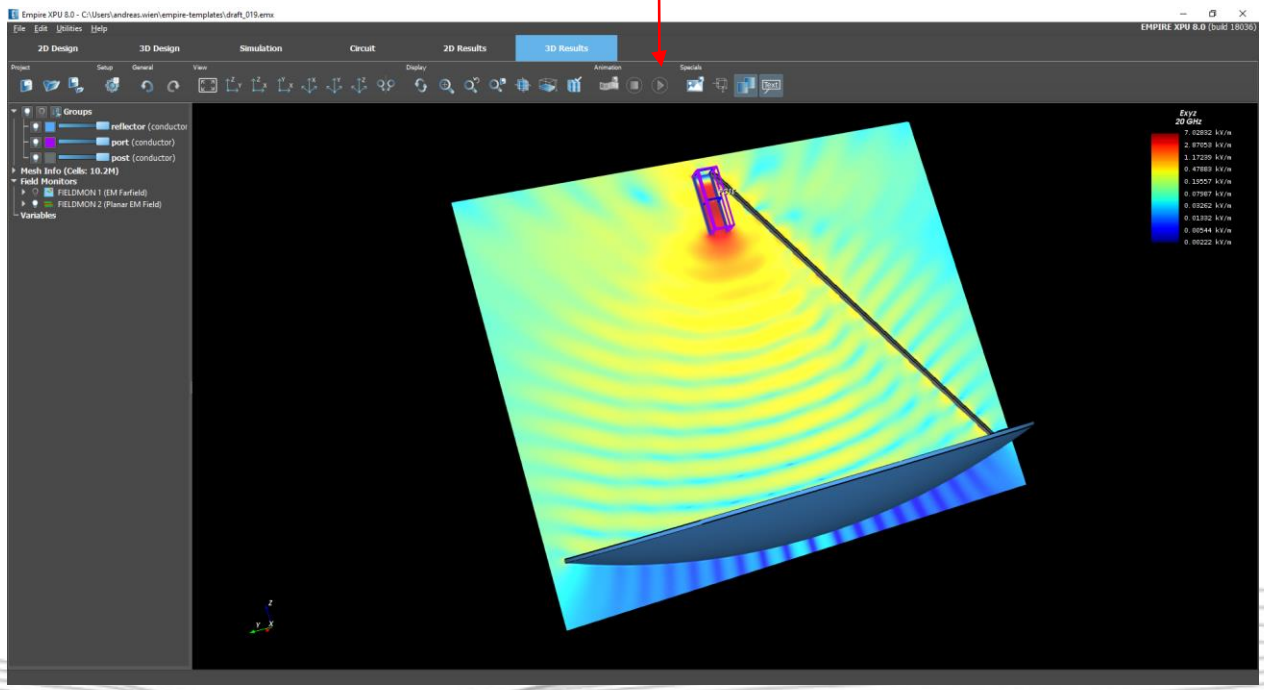
- Create a new plot
- Plot Type: “Far Field”
- Select Format: “e() farfield polar (dB)”
- Click in Type column to sort

- Select the top 6 curves, right click and choose ‘Show only and autocolor’ This adds Eabs files for 15, 20, 25 GHz, for phi=0 and for phi=90



Step 13: Near Field

- Switch to 3D Results
- Switch off EM Farfield
- Open Monitor 2: EM Planar EM Field
- Select Parameters → 3D Plot Options
  - Set Animation Loop : phase_15_deg
  - Close window with OK
- Click Start to display the animation



Step 14: 3D Far Field

- Turn off near field Monitor and turn on farfield Monitor 1