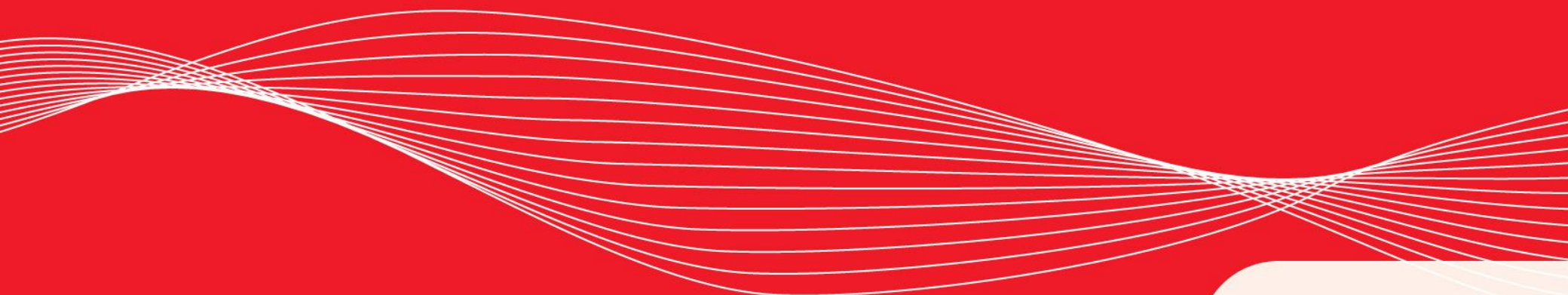


EMPIRE XPU Tutorial

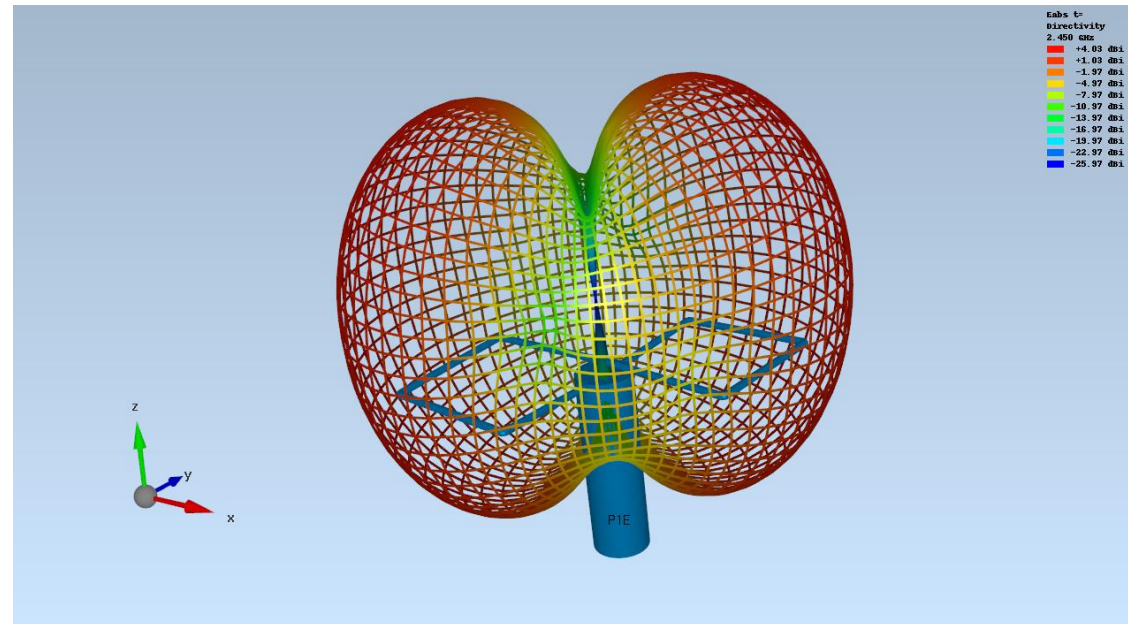
3D Design – Biquad Antenna



Overview: Topics

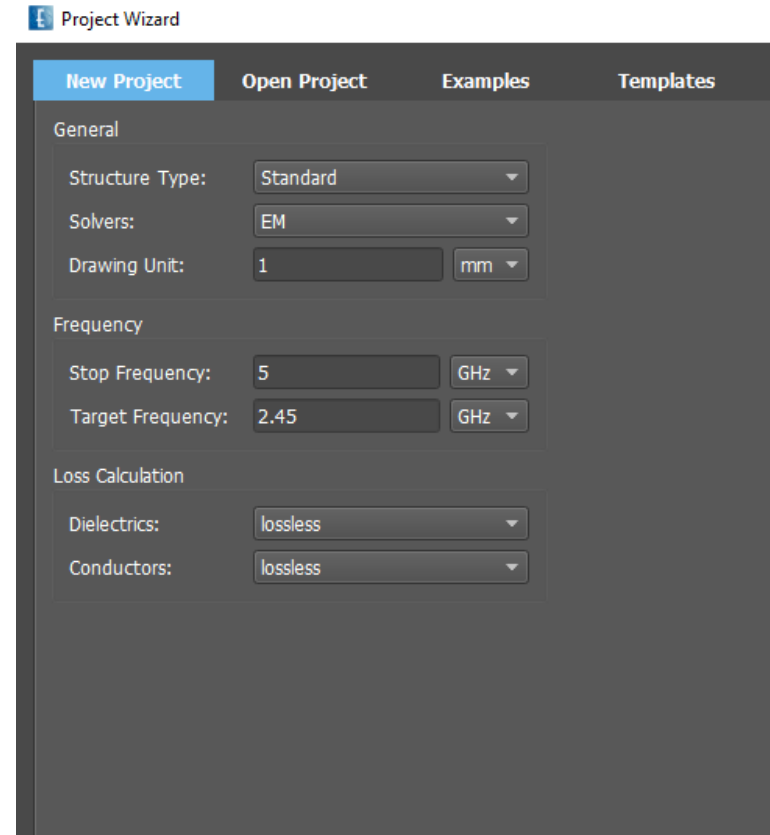
- Start New Project
- 3D structure definition
- Coaxial Port
- N-point Wires

- S-Parameters, impedances
- Far field



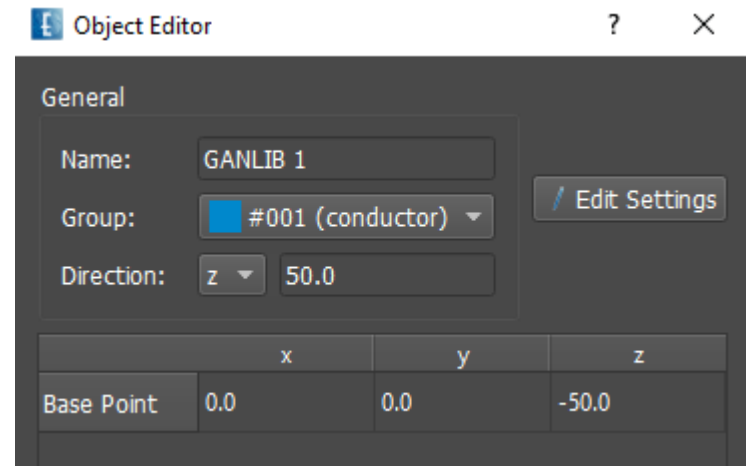
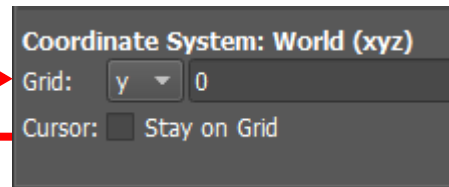
Step 1: Start

- Start Empire from Desktop
- Select „New Project“
- Set „Drawing Unit“ 1mm
- Set „Stop Frequency“* 5 GHz
- Set „Target Frequency“ 2.45 GHz
- OK
- File → Save as
- Create new directory “biquad” and save file



Step 2: Coaxial Feed

- Set grid to $y=0$
- Click „Create Source“
- Select Coax Tab
Choose Coax
- Left click at $x=0, y=0, z=0$ to define feed position (origin)
- Left click at $x=0, y=0, z=-50^*$ to define load position
- Left click at $dv = -1.5$ ($du=0$) to define the inner coax radius
- Left click at $dv = -5$ ($du=0$) to define the dielectric radius



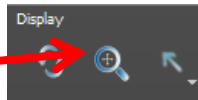
Comments:

- Use e.g. Page down key to access value

Step 3: Coaxial Feed

- Click „Edit Settings“
- Adjust values:
da: 15 (outer coax diameter)
lr: 4 (extension length of inner conductor)

- Close with OK
- Zoom extents

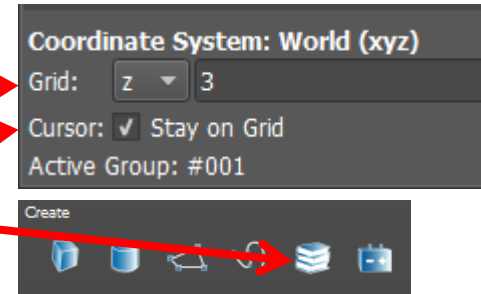


Geometry

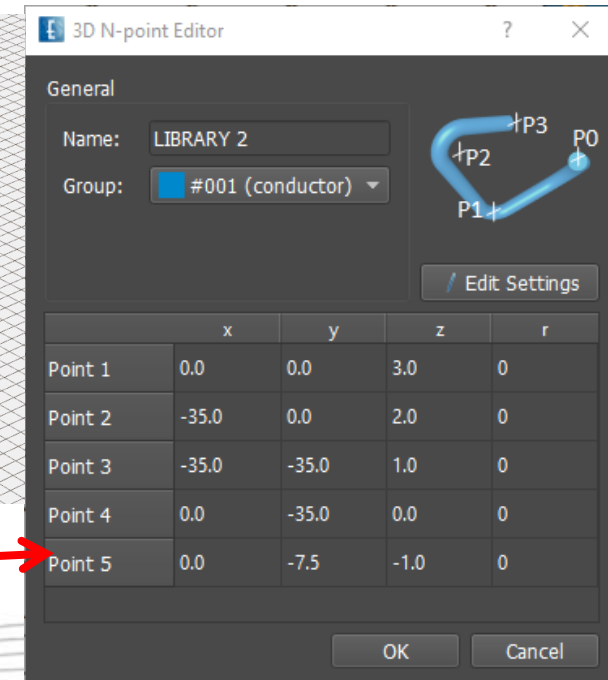
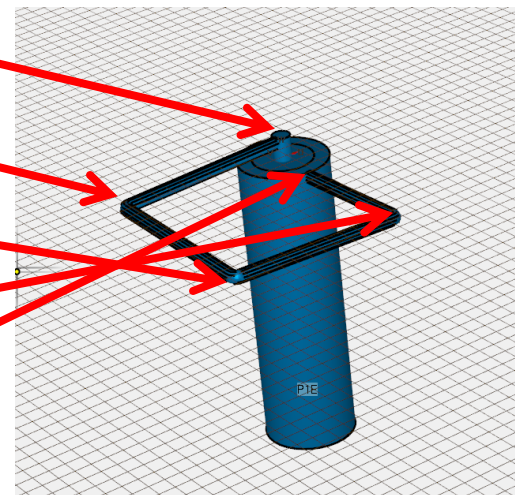
Inner	Diameter	di=	3.0
Dielectric	Diameter (>di)	dd=	10.0
Outer	Diameter (>dd)	da=	15
Rod length (>=0)		lr=	4

Step 4: Wire loop

- Set grid to z=3
- Enable „Stay on grid“ snapping
- Click „Create Library Object“
- Select „3D Wire“ - „3D N-Point“
- Zoom in (2x Page up)



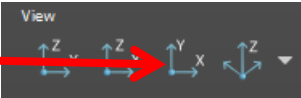


- Left click at x=0,y=0
- Height dw=0
- Left click at x=-35,y=0
- Height dw=-1
- Left click at x=-35,y=-35
- Height dw=-2
- Left click at x=0,y=-35
- Height dw=-3
- Left click at x=0,y=-7.5
- Height dw=-4
- Long left click to finish
- Optionally adjust points
- Click „Edit Settings“ d=2, OK
- OK

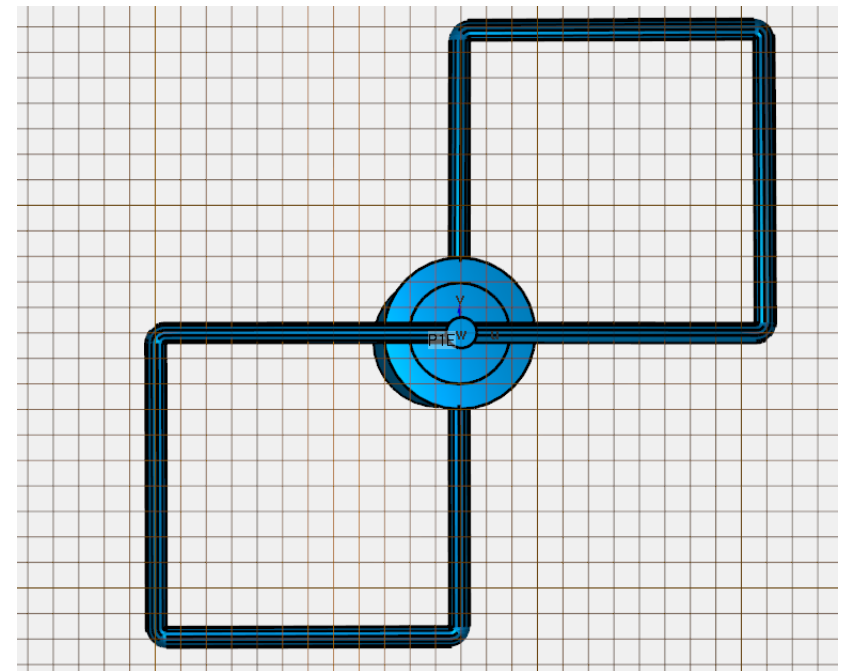


Comments:

* Zoom in/out to access values

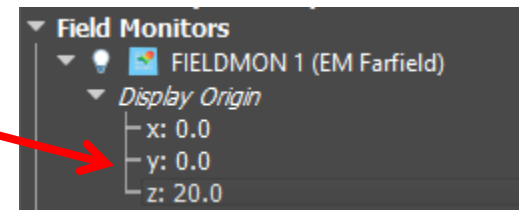
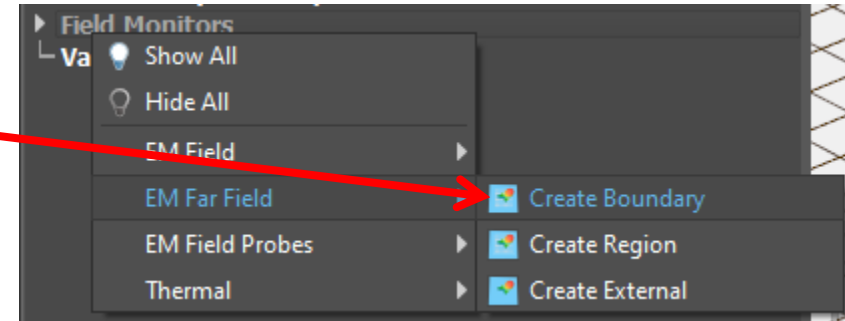
Step 5: Rotate

- Select Top View 
- Shift + Left click at $x=0, y=0$ to enter a point
- Select Loop with left click*
- Click Copy and Rotate 
- Enter 180 (degrees)
- OK
- Return to „Iso-z view“ 



Step 6: Field Monitor

- Right click on Field Monitors on the left
- Select EM Far Field – Create Boundary
- OK
- Set Display Origin for 3D display to:
x=0, y=0, z=20



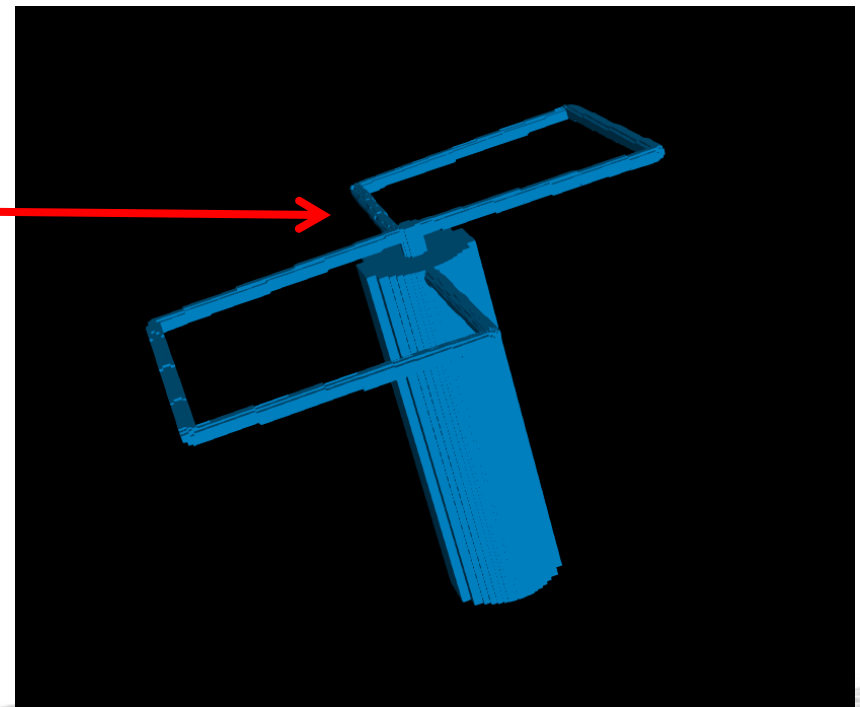
Step 7: Mesh

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



This command shows the meshed 3D structure and switches to 3D Display mode

All objects are mapped to the mesh and their consistent meshing (e.g. open or short) can be checked.

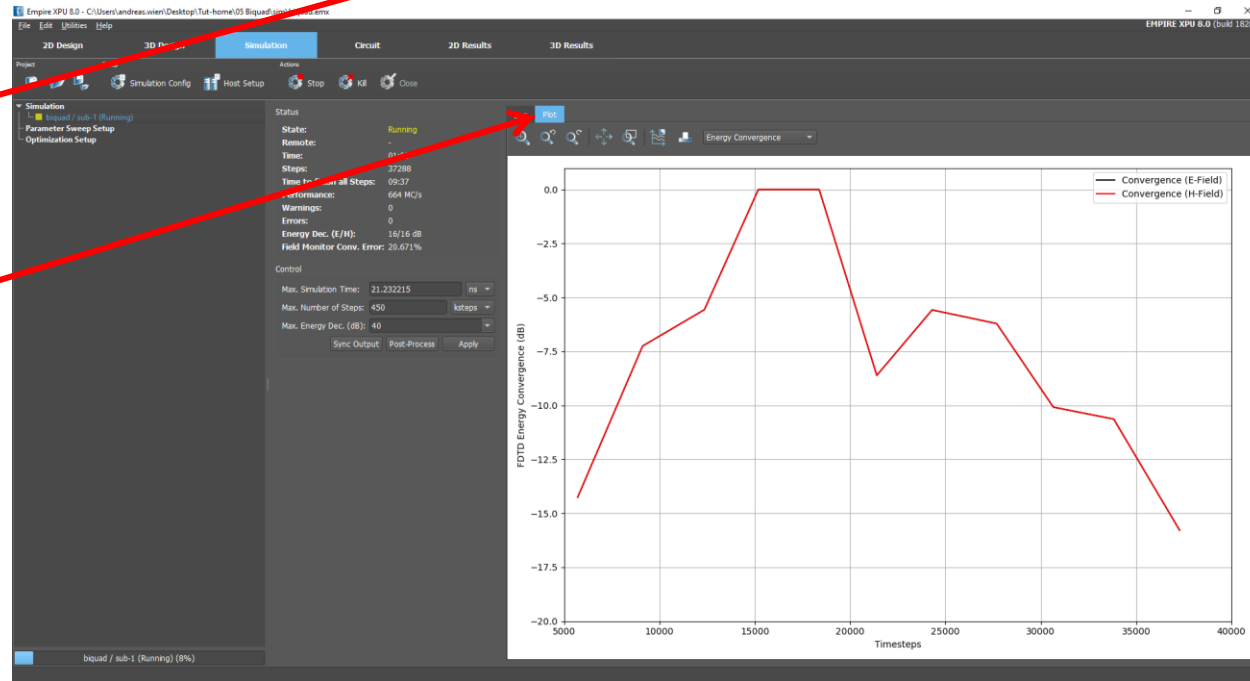


- *Return to 3D Design mode*

Step 8: Simulation



- Click „Start Simulation”, OK
- After simulation started, the simulation progress is shown (energy vs time)
- Wait for status finished
- Switch to 2D Results
- Click Reload Data

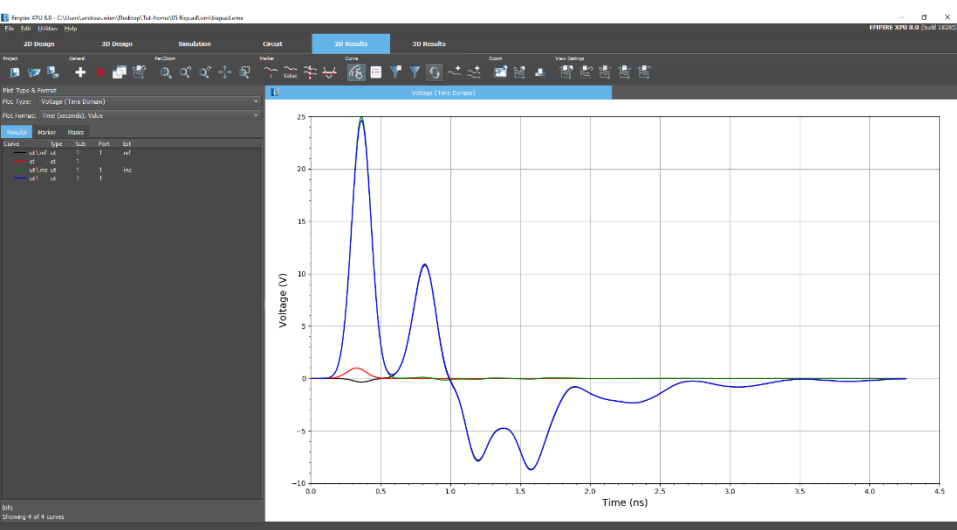


Comments:

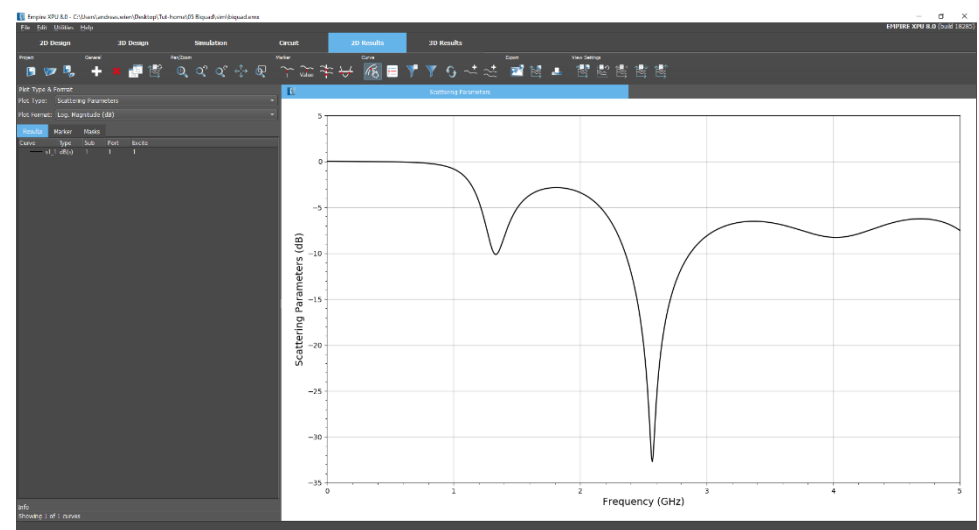
- The following will be executed
 - Automatic Meshing and saving the input file
 - Preprocessing (creating simulation files and folders)
 - Statistics and Memory estimation (Simulation Tab, log window)
 - Compilation (creating the source code)
 - Running the simulation and displaying the voltage time series
 - Postprocessing (DFT, Far field, ...)

Step 9: Results

- Plot Type Voltage (Time Domain)



- Plot Type S-Parameters



Comments:

- *Format depends on selected type, e.g. dB or lin*
- *Right click to open a context menu in Legend or Plot area to adjust file selection or plot range*

Step 10: Far field

- Plot Type: Far Field
- Plot Format: Polar Lin. Magnitude
- Select Component „eabs“
- Right click „show only and autocolor“

- Select 3D Results Tab
- Switch on Field Monitor
- Right click on FIELDMON 1
- Edit
- Choose Plot Style „Wireframe“ , OK

Comments:

- By default, the absolute component is selected in 3D display. Select other components by choosing “Polarization”

