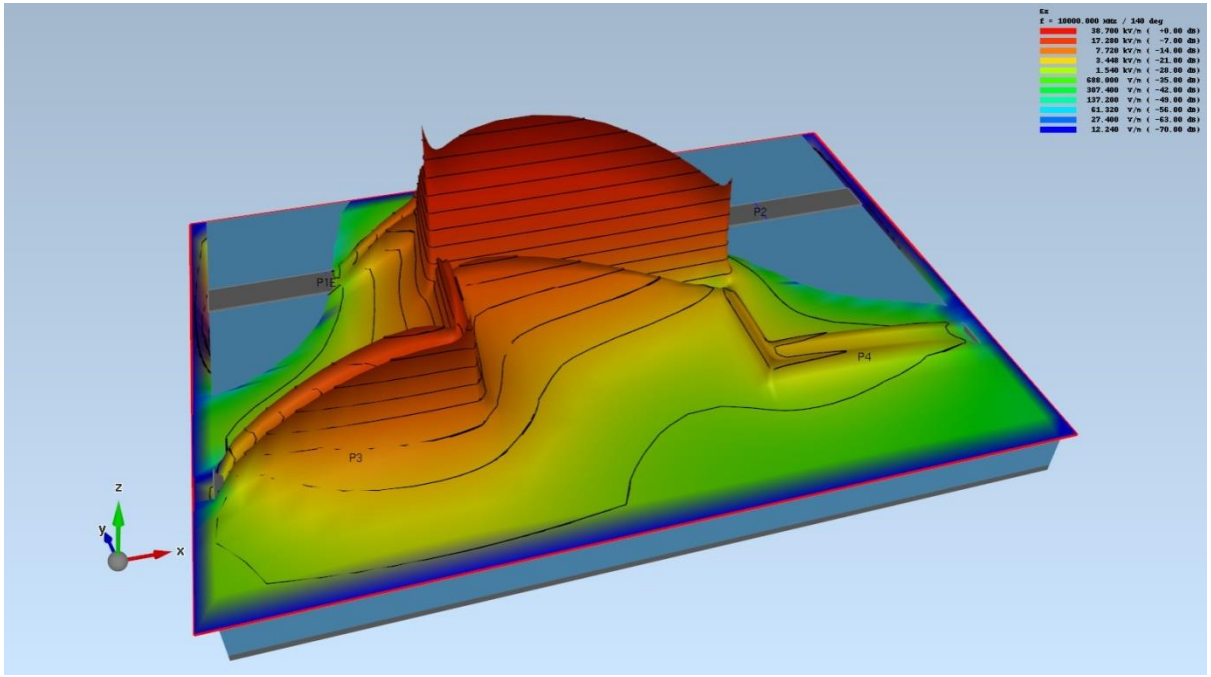
EMPIRE XPU Tutorial

Backward Wave Coupler

Overview

→Topics

- Use template
- Check Impedance
- Move & Copy ports
- Adjust QTEM ports
- Create Strips
- Copy and Mirror objects
- Simulation
- Results



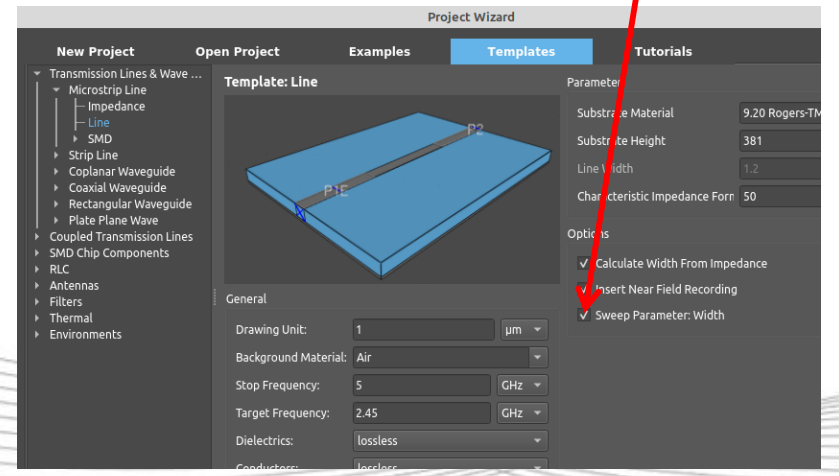
- Target frequency: 10 GHz

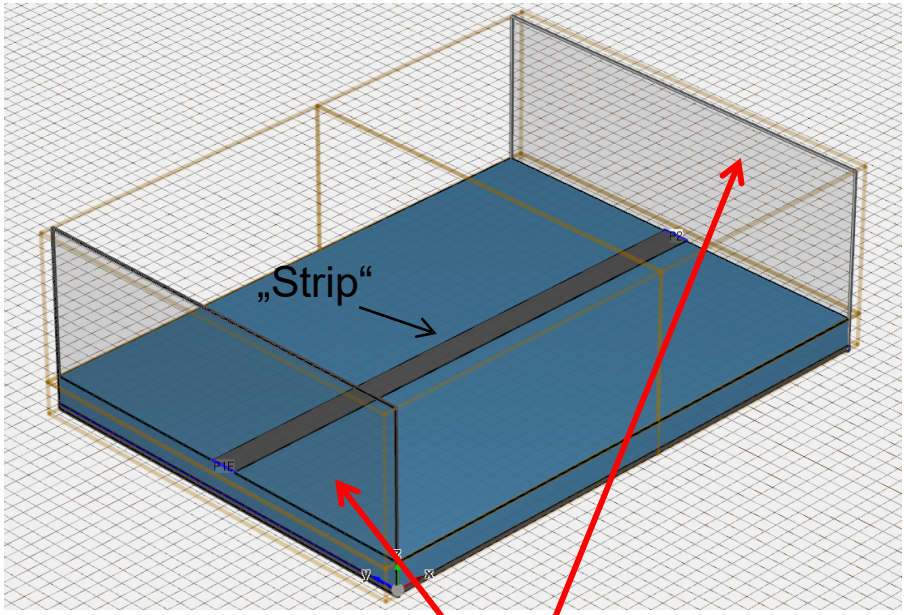
Step 1

→Start

- Start Empire XPU
- Checkmark „Sweep Parameter: Width“
- OK
- Menu – File - Save as
- Create new folder, e.g. coupler
- Enter file name, e.g. bwc*
- Open Field Monitors – Click light bulb to hide frame

* On Windows, extension is added automatically

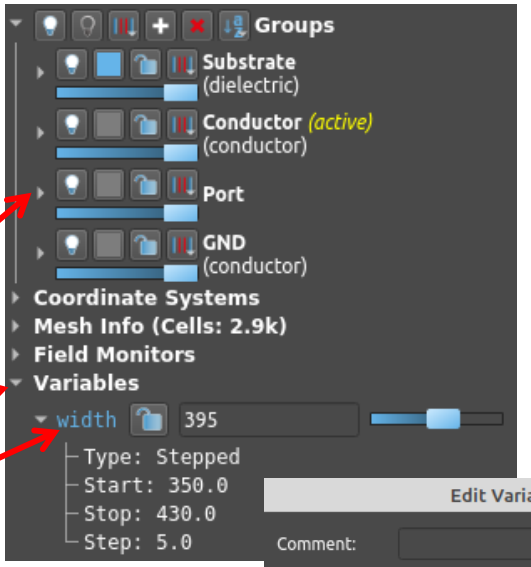


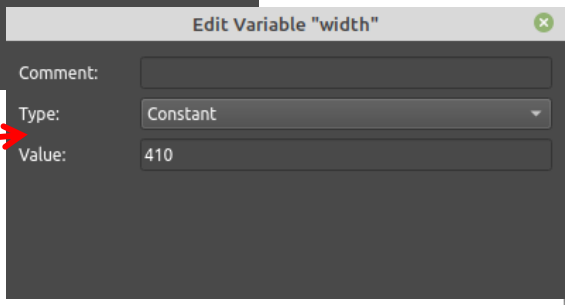


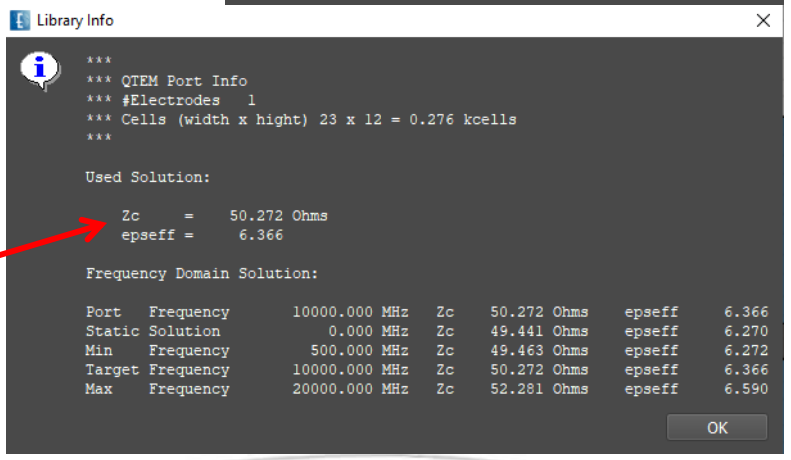
Comments:
The default QTEM Ports are used. The substrate permittivity is 9.2.

Step 2

→Check Impedance







- Open Variables, Right click on width – Edit
- Set Type: Constant, Value: 410
- OK
- Open Group Port - Sources
- Right click on GANLIB 1 – Edit
- Click Edit Settings
- Click „Info“ button
- Close with OK, Press Esc key

Comments:
Width=410 yields approx. 50 Ohm with epseff=6.37

-> 2.97mm is a quarter wavelength at the target frequency of 10 GHz.

Step 3

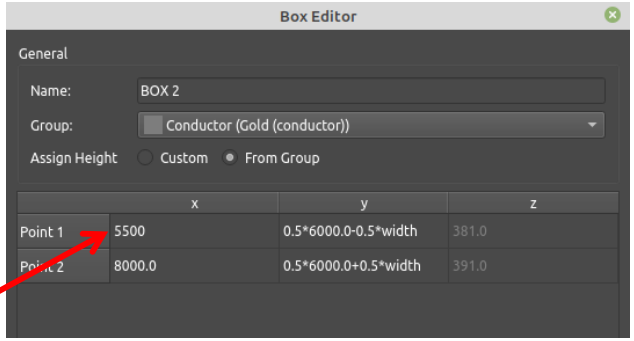
→Resize ports and strip

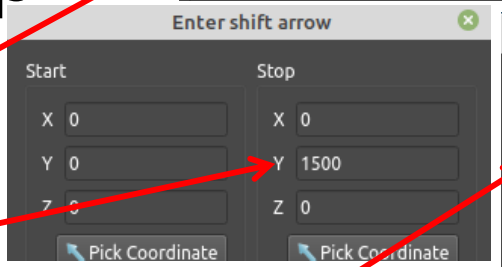
- Select strip
- Click Open Object
- Set Point 1 x= 5500, OK
- Click “Move“
- Enter Stop: y=1500, OK

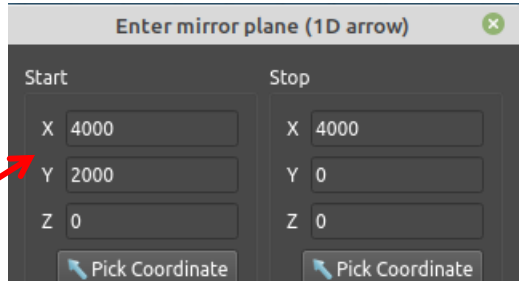
- Select Strip
- Click Copy & Mirror
- Enter Start x=4000, y=2000 (any but 0)
- Enter Stop x=4000

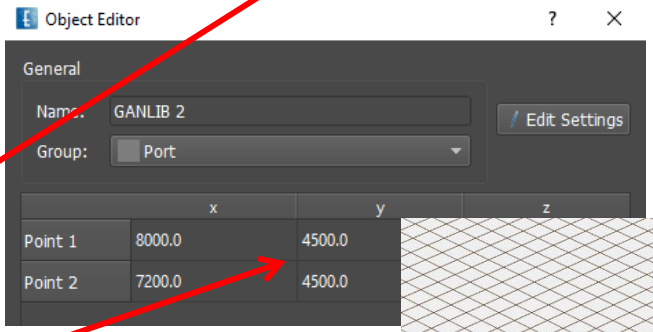
- Right click on GANLIB 1 – Edit
- Enter y=4500 on Point 1 and Point 2
- Click Edit Settings
- Set dw0 = dw1 = 1200 (unit)
- OK, Escape Key, Redraw

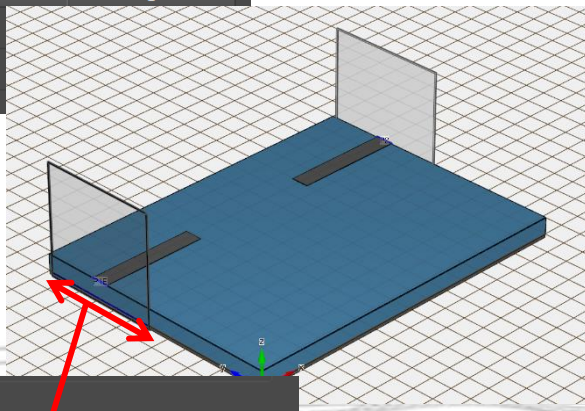
- Repeat for GANLIB 2





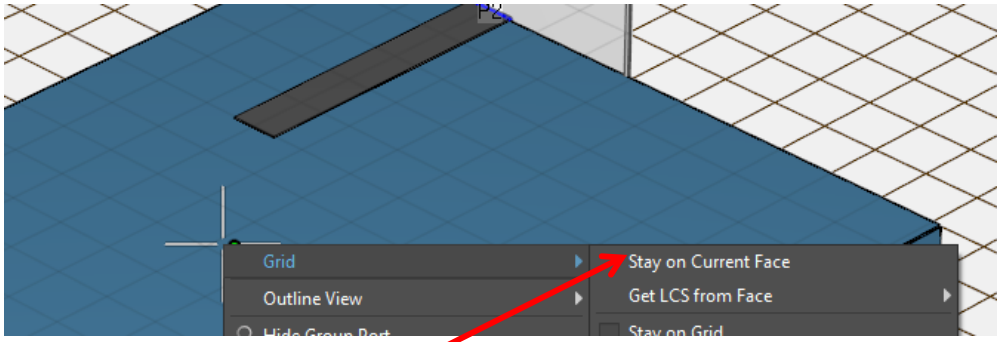






Step 4

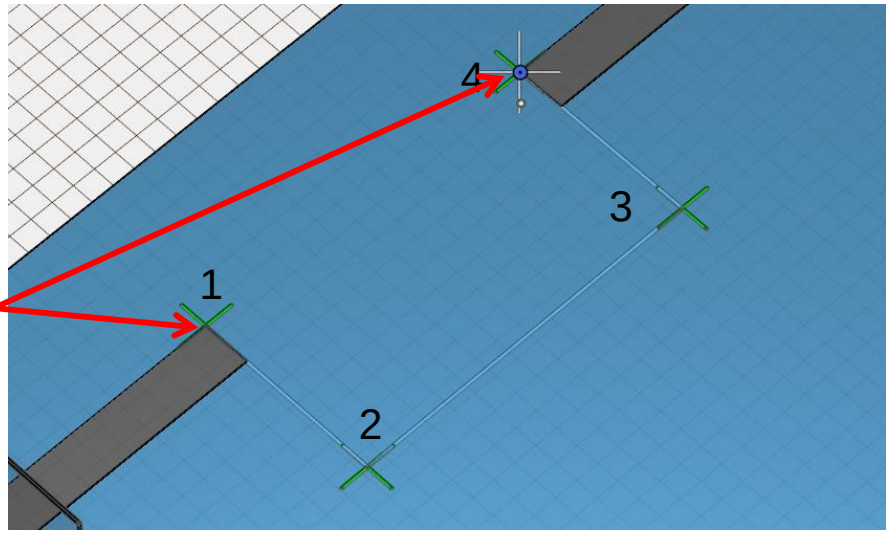
→Create strip



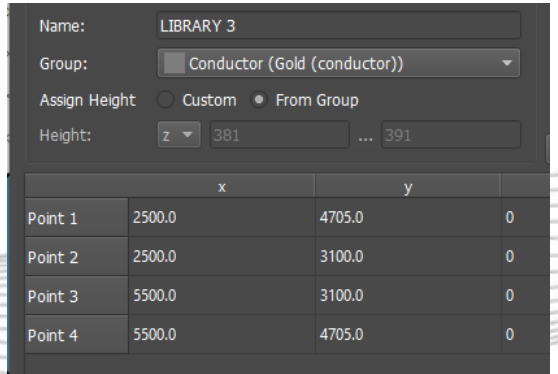
- Fix Grid: Move cursor on Substrate. Right Click for Menu, select Grid - Stay on Current Face“

- Zoom in
- Click Create Strip 

1. Shift + Left Click at Corner
2. Shift + Left Click at x=2500, y=3100
3. Shift + Left Click at x=5500, y= 3100
4. Long click at Corner (to finish)



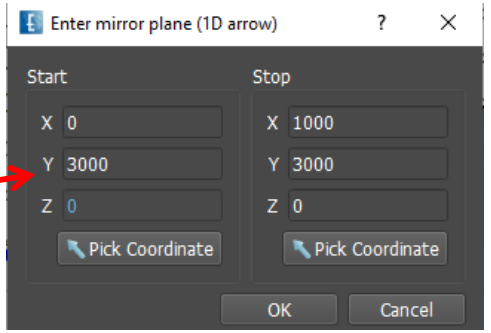
- Long click to use group height
- Click Edit Settings
- Enter Strip width: 100
- Close with OK



Step 5

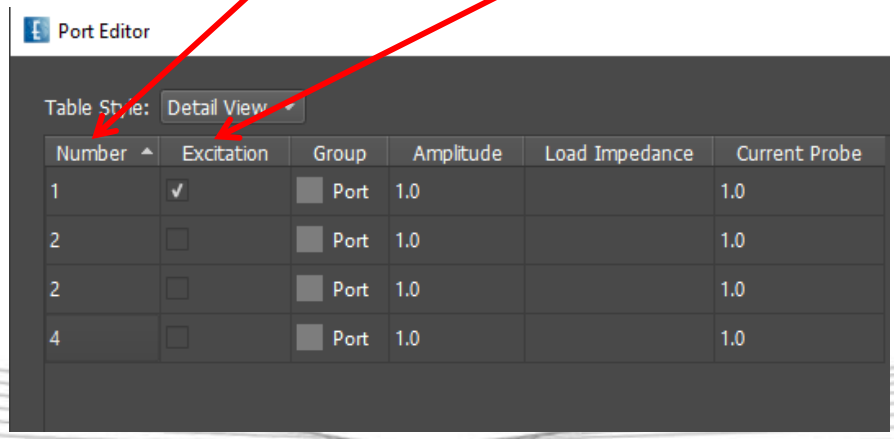
→Mirror ports and strip

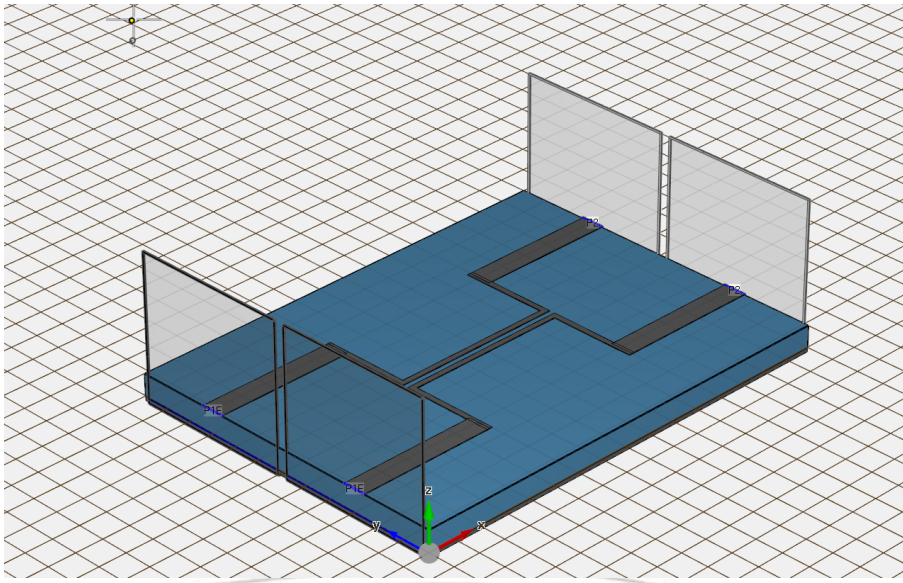
- Right click on group „Ports“ – Select group objects
- Right click on group „Conductor“ – Select group objects
- Click „Copy and Mirror“
- Enter Point 0: x=0, y=3000
- Enter Point 1:x=1000, y=3000, OK



- Click Port Setup Wizard

- Set Port Numbers and Excitation, OK



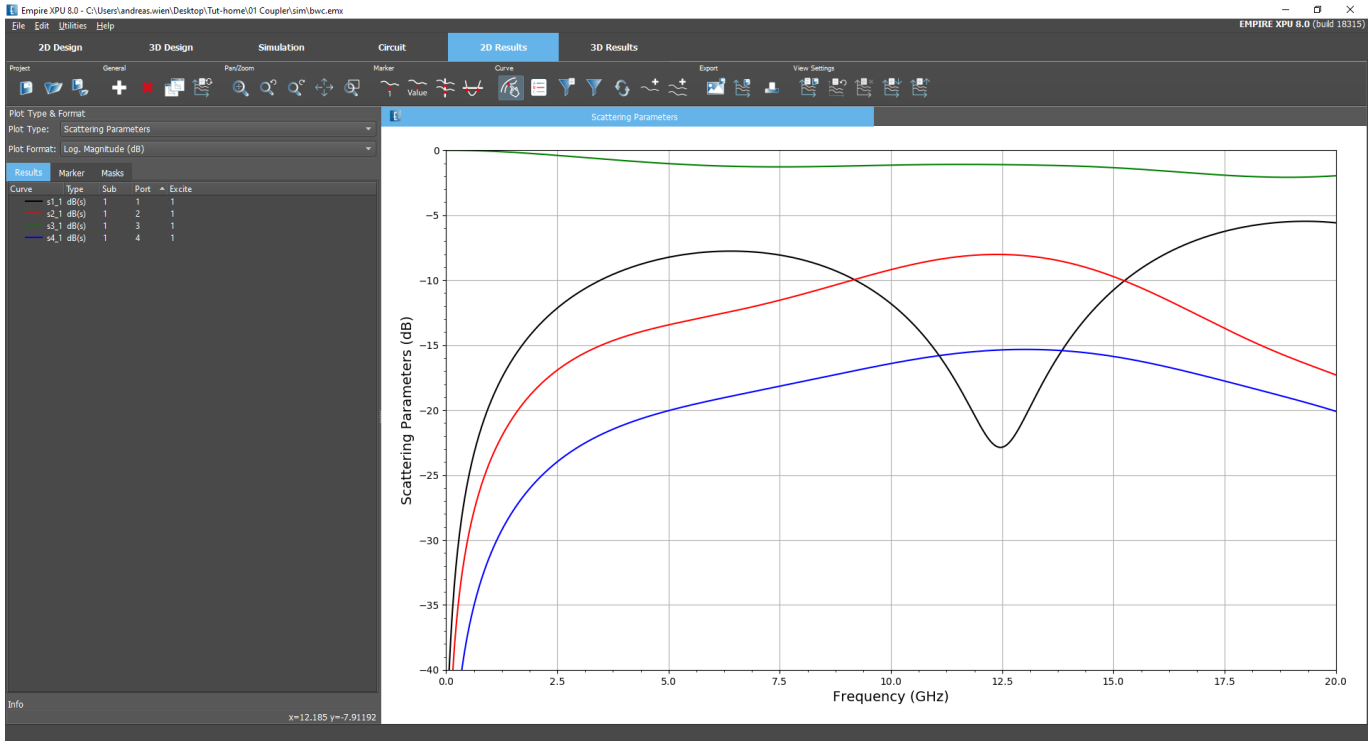


Step 6

→Results

- Click „Start Simulation“, OK
- Select 2D Results tab

- Optional:
- Right click for menu
- Configure PLot
- Set y range min -40



Hints:
Black: Input reflection 1
Green: Through port 2
Red: Backwave coupled port 3
Blue: Isolated port 4

Step 7

→Animation

- Select 3D Results Tab
- Open Field Monitors - Switch on light bulb
- Right click on Plane yz - Remove
- Right click on FIELDMON 1 – Edit
- Field Plot Amplitude = 3000, OK
- Click Start Animation