

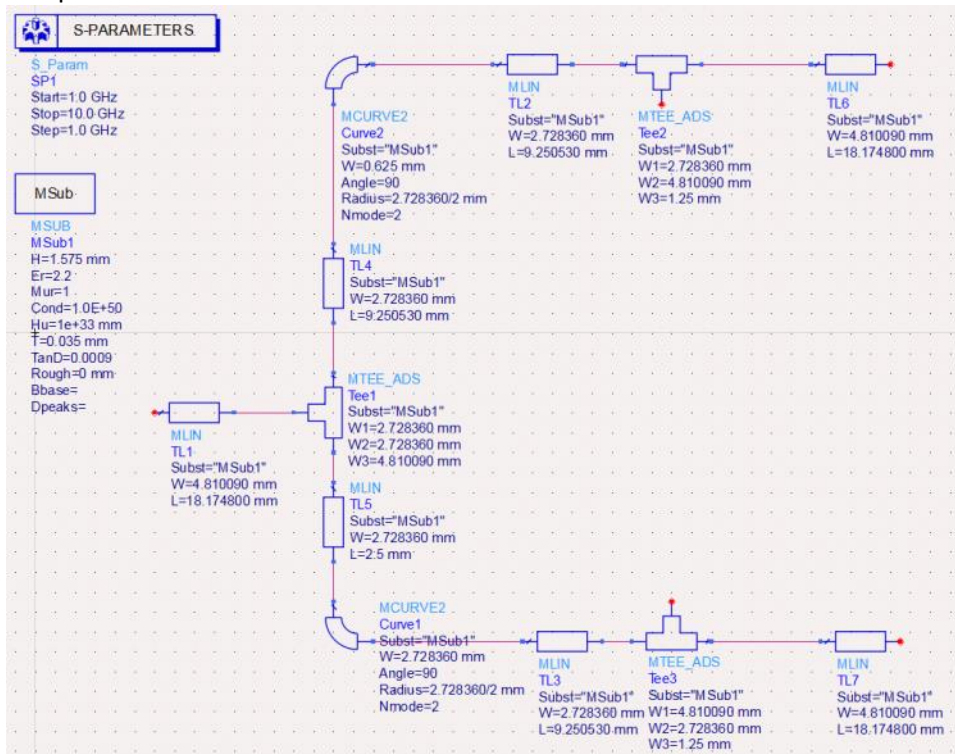
RF and Microwave (ADS) Lab 3 Steps

Submitted by **Saurabh Kumar**
(SC22B146)

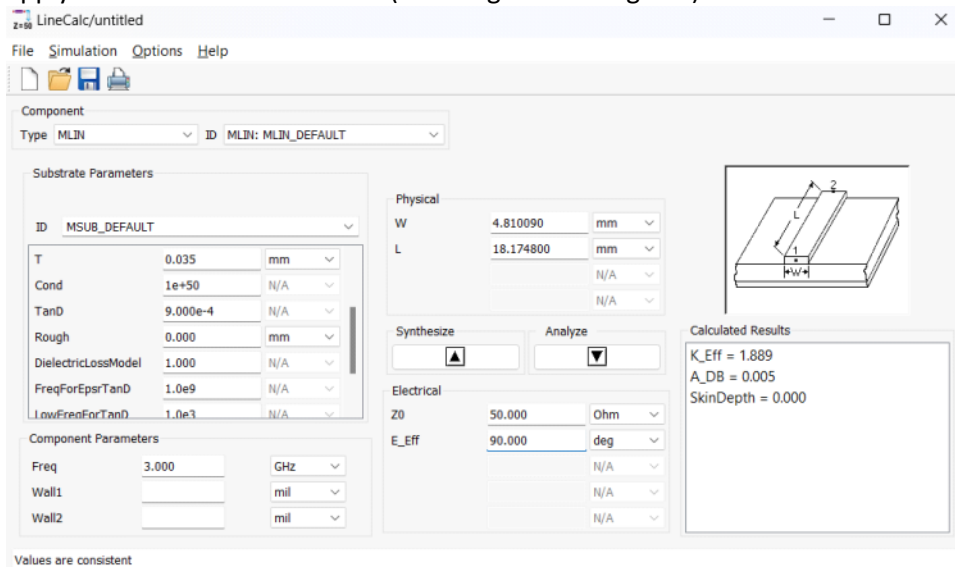
1. Design a 1:2 Wilkinson Equal Power Divider using Microstrip line. (The operating frequency is also 5 GHz).

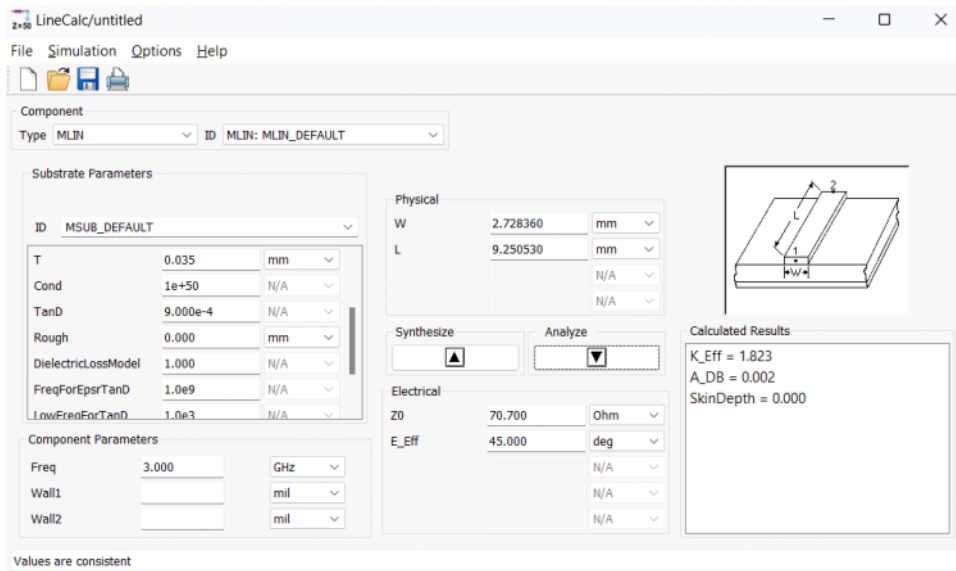
Procedure and Observations:

- a. Design the power divider as shown in the figure with the help of MLIN, MCURVE and MTEE components.

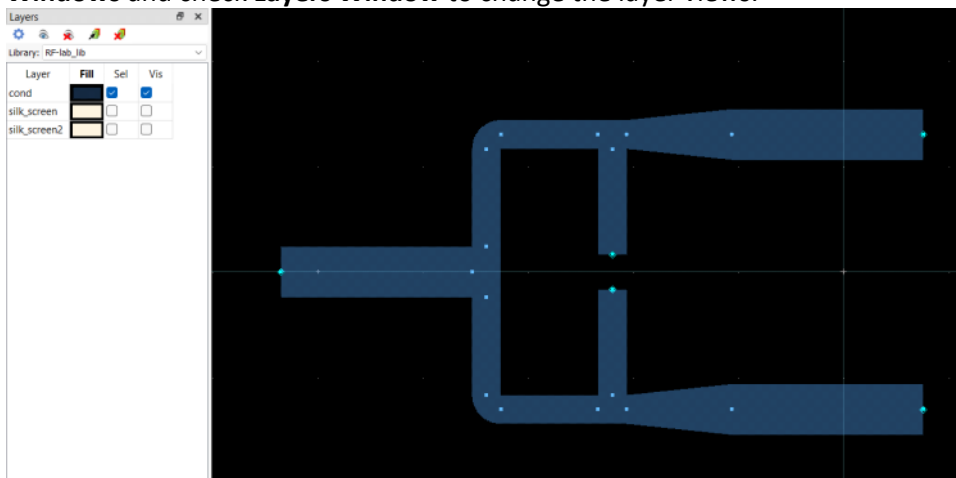


- b. Calculate their desired width and lengths using **LineCalc** tool with the entries as shown in MSub component. The widths of branch of an MTEE will be same as the width of MLIN it is facing. Same will apply for the radius of MCURVE (with angle of 90 degrees).





- c. Go to **Layout** tab -> **Generate/Update Layout** -> **Ok** to get the **Layout** window. Go to **View** -> **Docking Windows** and check **Layers Window** to change the layer views.



- d. Click on **Substrate Editor** to open it.



- e. Add a new layer named **top_layer**.

Add Layer / Display Properties

Adds a new Display Property with a new or existing layer. Enter the new layer information or select an existing layer.

☒ Add new layer

Layer Name:

Layer Number:

Layer Process Role:

Layer Binding:

Existing Layer Name	Number	Process Role	Binding
silkscreenTop	1	Silk Screen	
cond	2	Conductor	
M2	3	Conductor	
M3	4	Conductor	
cond2	5	Conductor	
silkscreenBottom	6	Silk Screen	

Purpose Name:

- f. Select the substrate and click on ... beside **Material**. Then, click on **Add From Database** and select **Rogers_RT_Duroid5880** from the **Dielectrics** tab.

Material Definitions

View Technology for this Library:

Conductors Dielectrics Semiconductors Surface Roughness

Material		Loss Parameters						Permeability (M)	
Material Nam	Library	Parameter Typ	Real	Imaginary	Tnom	TC1	TC2	Real	Imagi

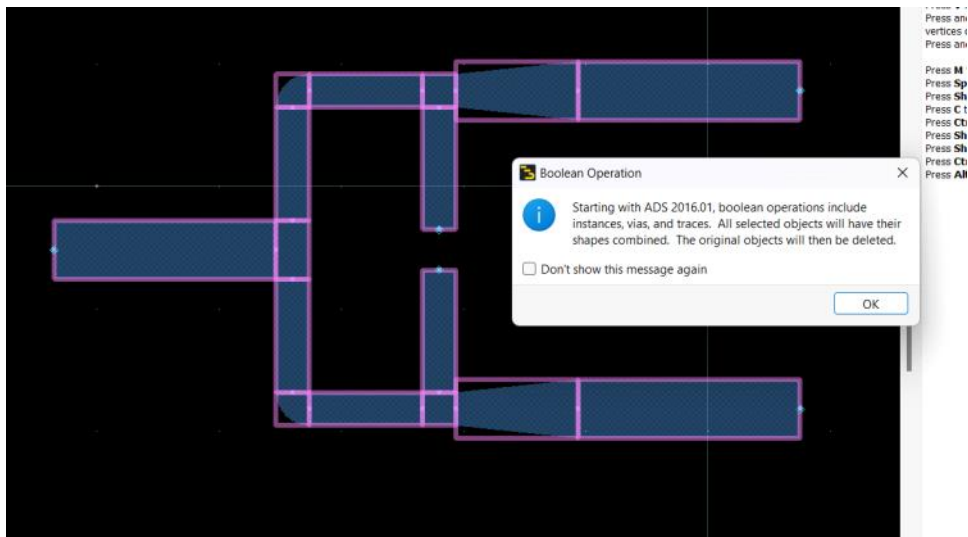
Add Materials From Database

Select materials to add to the technology:

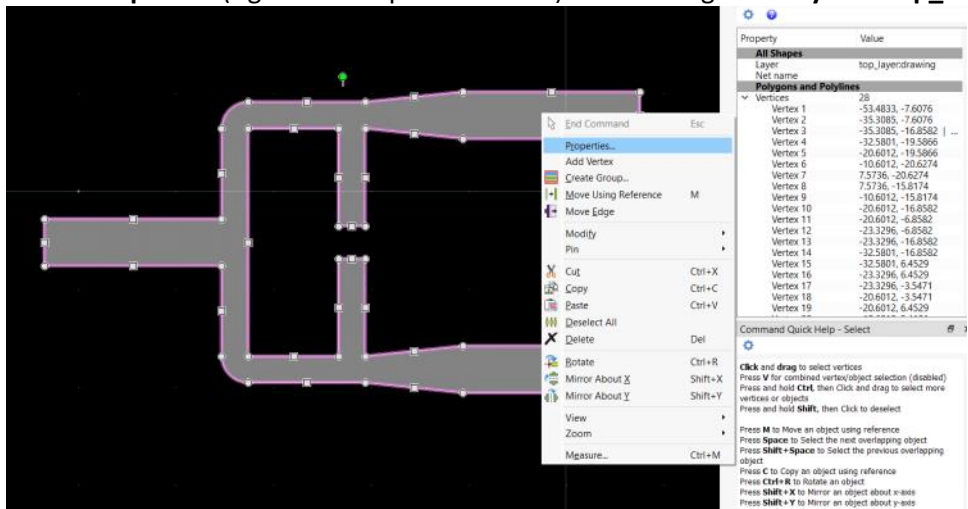
Conductors Dielectrics Semiconductors

Name	Er Real	Er Imag	Er TanD	MUr Real	MUr Imag	Model Type	Ti
Rogers_RO3210	10.2		0.003	1		Svensson/Djordjevic	
Rogers_RO4003	3.55		0.0022	1		Svensson/Djordjevic	
Rogers_RO4350	3.66		0.004	1		Svensson/Djordjevic	
Rogers_RT_Duroid5870	2.33		0.0012	1		Svensson/Djordjevic	
Rogers_RT_Duroid5880	2.20		0.0009	1		Svensson/Djordjevic	
Rogers_RT_Duroid5881	2.17		0.0009	1		Svensson/Djordjevic	
Rogers_RT_Duroid6002	2.93		0.0013	1		Svensson/Djordjevic	
Rogers_RT_Duroid6006	6.15		0.0012	1		Svensson/Djordjevic	

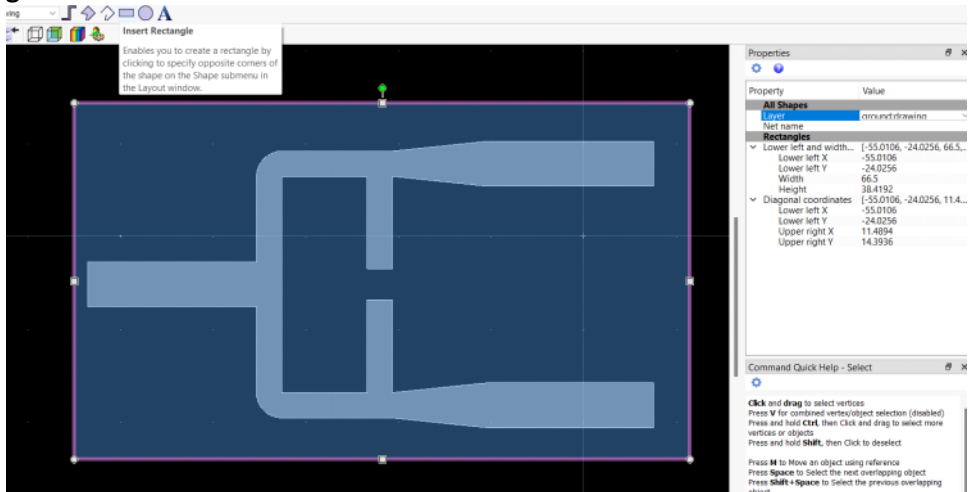
- g. Set the material to **Rogers_RT_Duroid5880** and thickness to 1.5748 mm.



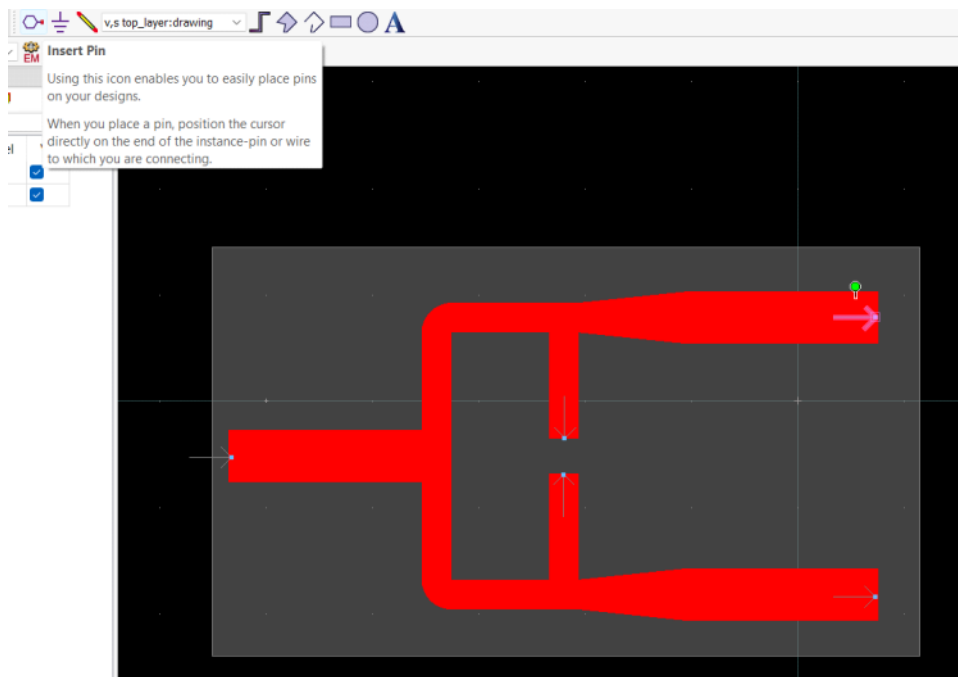
- k. Got to **Properties** (right click on power divider). Then change the **Layer** to **top_layer:drawing**.



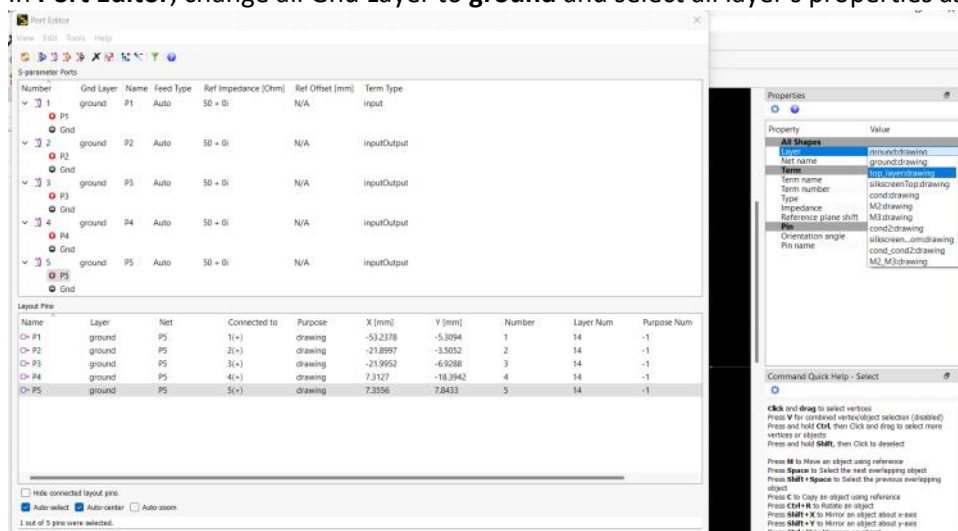
- l. Draw a rectangle such that it covers the complete power divider, and change its Layer property to **ground**.



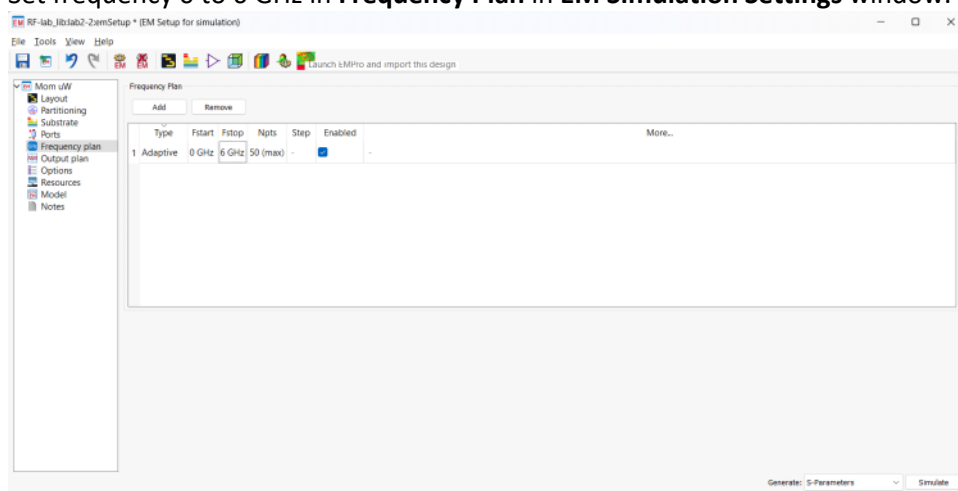
- m. Make the ports using **Insert Pin** tool.



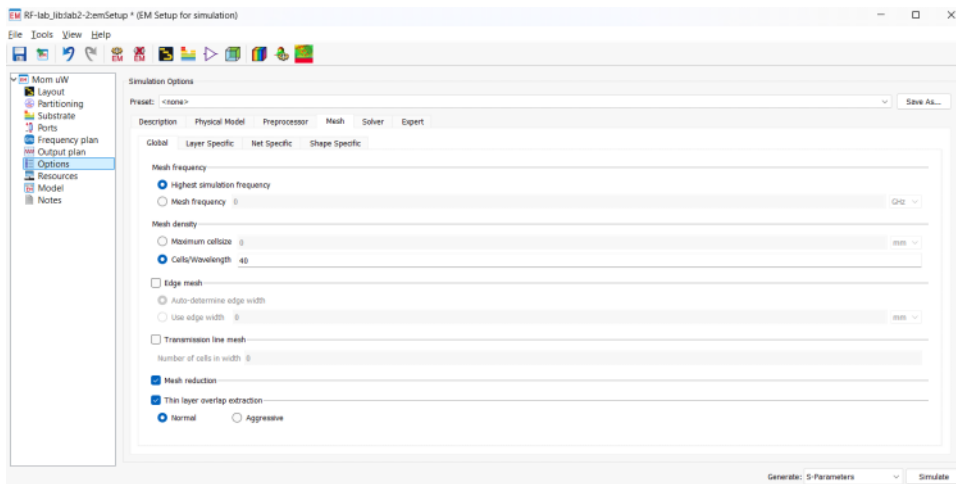
- n. In **Port Editor**, change all Gnd Layer to **ground** and select all layer's properties as **top_layer**.



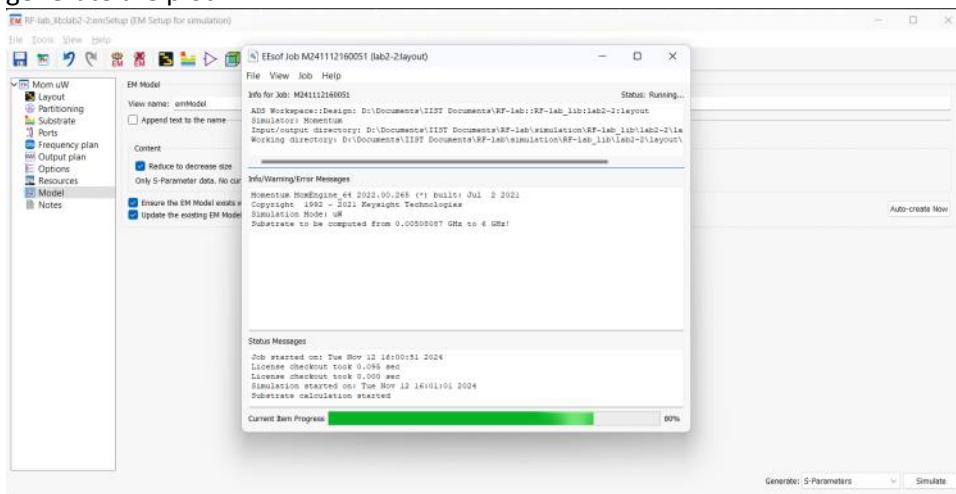
- o. Set frequency 0 to 6 GHz in **Frequency Plan** in **EM Simulation Settings** window.



- p. Change Cells/Wavelength from 20 to **40** under **Mesh** in **Options**.

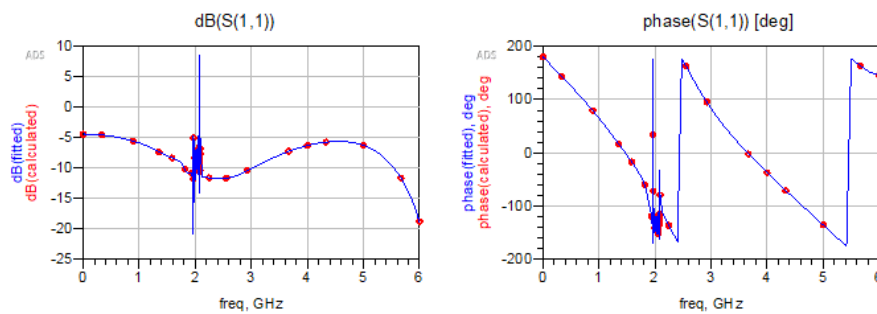


- q. Tick **Ensure the EM Model exists** when the simulation is launched in Model and Simulate and generate the plot.

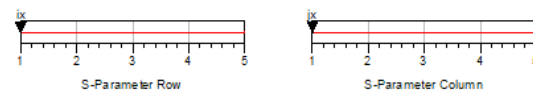


Mag/Phase of S(1,1)

Adaptively Fitted Points Discrete Frequency Points

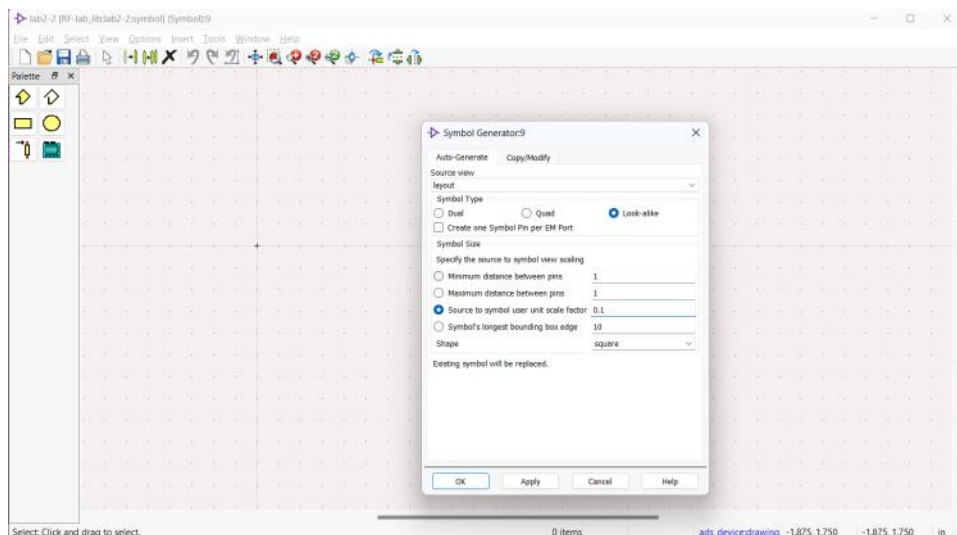


Select markers and use arrow keys to plot S(i,j)

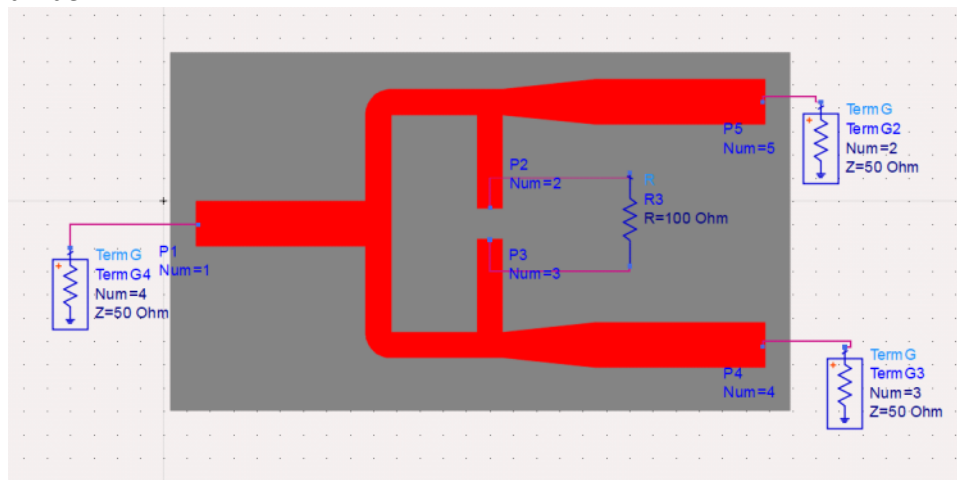


Dataset: lab2_2_MomUW_a - Nov 12, 2024

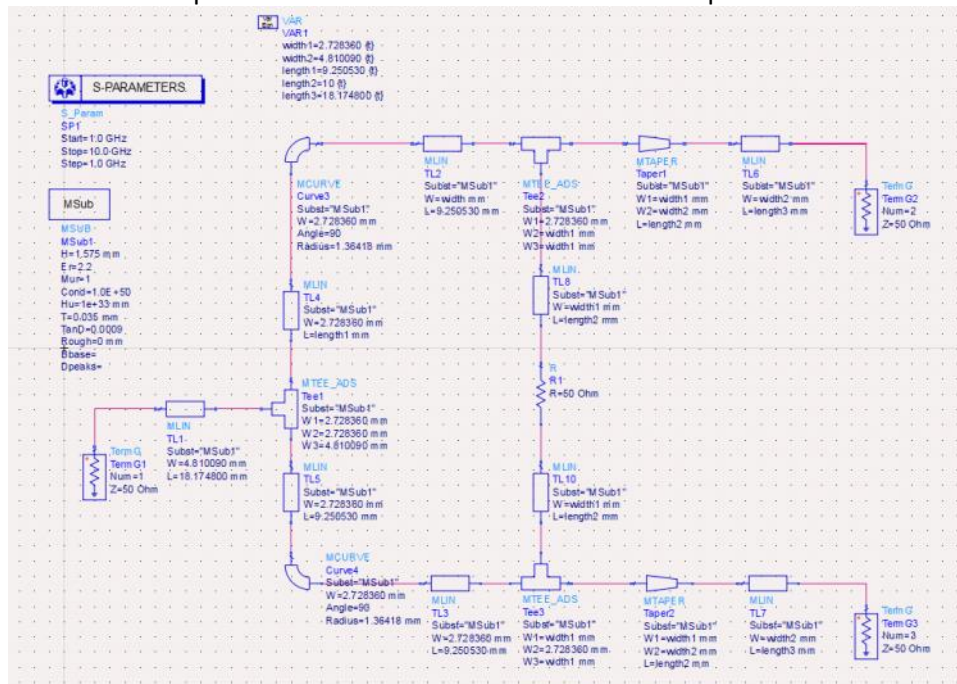
- r. After the simulation is done, go to **EM -> Component -> Create EM Model and Symbol**.



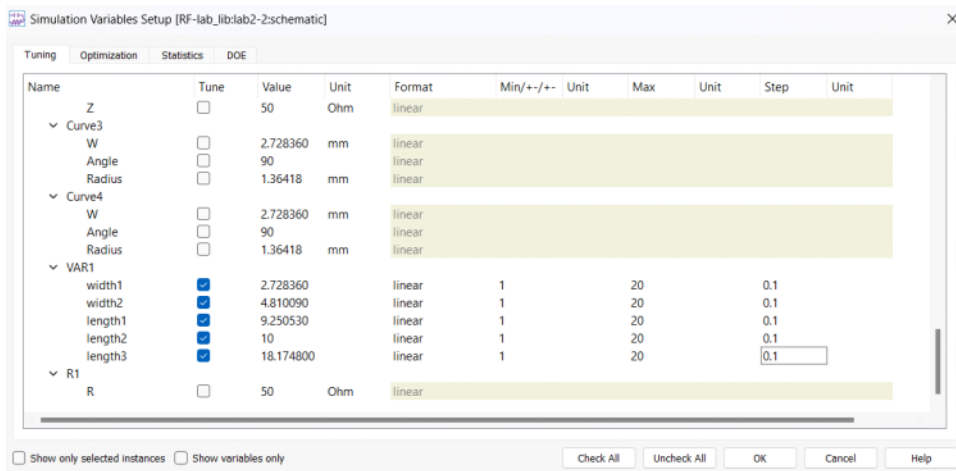
- s. Copy the symbol to a new schematic and add the **TermG** components to the ports of the power divider.



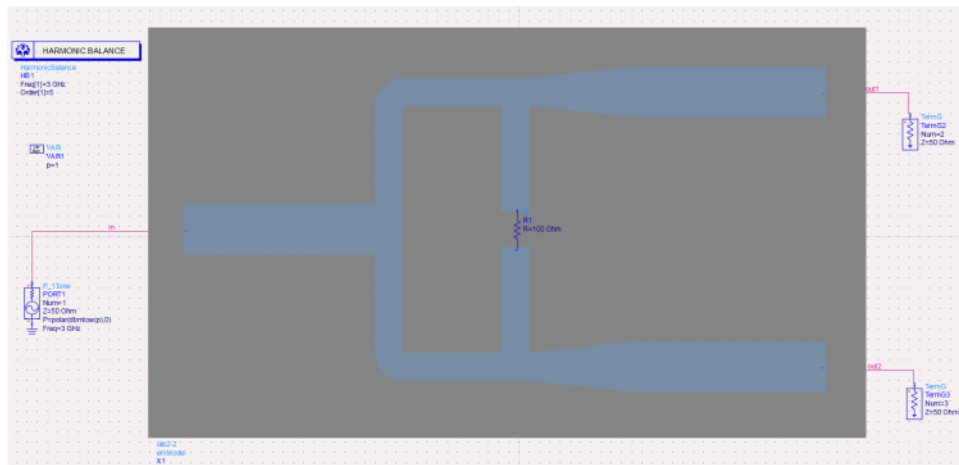
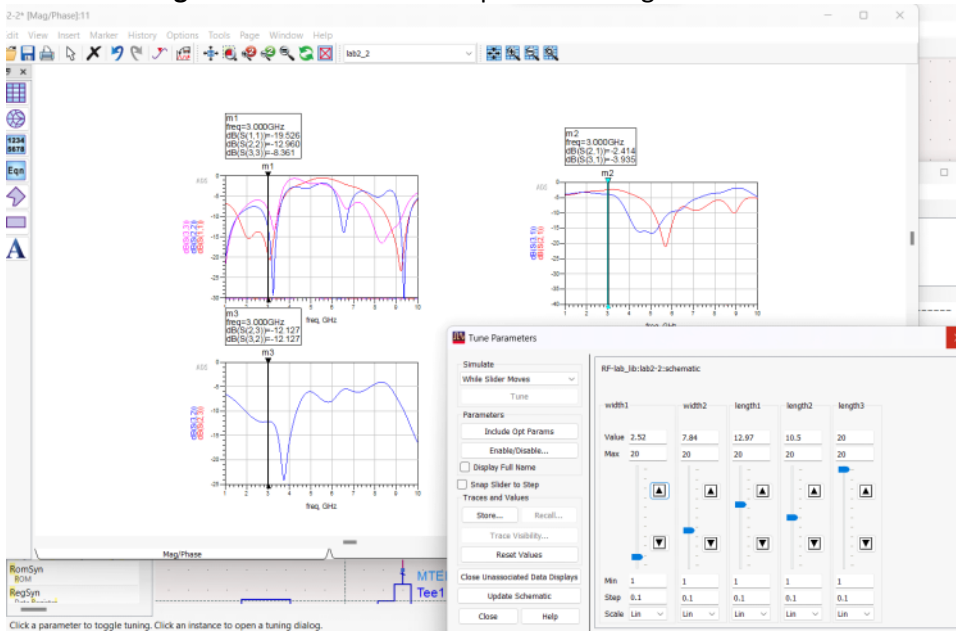
- t. Add a **VAR** component and add the variables with their respective values to tune them.



- u. Open the **Simulation Variable Setup** window from the Simulate tab. Setup the variables to be tuned with min/max and step values.



V. Click on **Tuning** from the schematic to open the tuning simulation.



Harmonic Balance:15

×

HarmonicBalance Instance Name

HB1

Freq

Sweep

Initial Guess

Oscillator

Noise

Small-Sig

◀▶

Fundamental Frequencies

Edit

Frequency

Order

3

GHz

5

Select

Fund

Frequency

Order

1

3 GHz

5

Add

Cut

Paste

Maximum mixing order

4

Levels

Status level

2

OK

Apply

Cancel

Help

Harmonic Balance:15

×

HarmonicBalance Instance Name

HB1

Freq

Sweep

Initial Guess

Oscillator

Noise

Small-Sig

◀▶

Parameter to sweep

p

Parameter sweep

Sweep Type

Linear

▼

☒ Start/Stop

☐ Center/Span

Start

-5

None

▼

Stop

5

None

▼

Step-size

1

None

▼

Num. of pts.

11

☐ Use sweep plan

▼

OK

Apply

Cancel

Help

Harmonic Balance:15

HarmonicBalance Instance Name
HB1

ator Noise Small-Sig Params Solver Output Display

Convergence

Convergence Mode: ☒ Auto (Preferred) ☐ Advanced (Robust) ☐ Basic (Fast)

Max. Iterations: ☐ Robust ☐ Fast ☐ Custom

Advanced Continuation Parameters...

Matrix Solver

Solver Type: ☐ Auto Select ☐ Direct ☒ Krylov

Matrix Re-use: ☐ Fast ☐ Robust ☐ Custom

Krylov Restart Length: ☒ Robust ☐ Low Memory ☐ Custom

Advanced Krylov Parameters...

Memory Management

Matrix Bandwidth (GuardThresh): ☐ Fast ☐ Robust ☐ Custom

FFT Options: ☒ Minimize memory and runtime ☐ Minimize aliasing

Waveform Memory Reduction:

☐ Use dynamic waveform recalculation

☐ Use compact frequency map

OK Apply Cancel Help

```
Eqn input=dBm(in[:,1])
Eqn output1=dBm(out1[:,1])
Eqn output2=dBm(out2[:,2])
```

