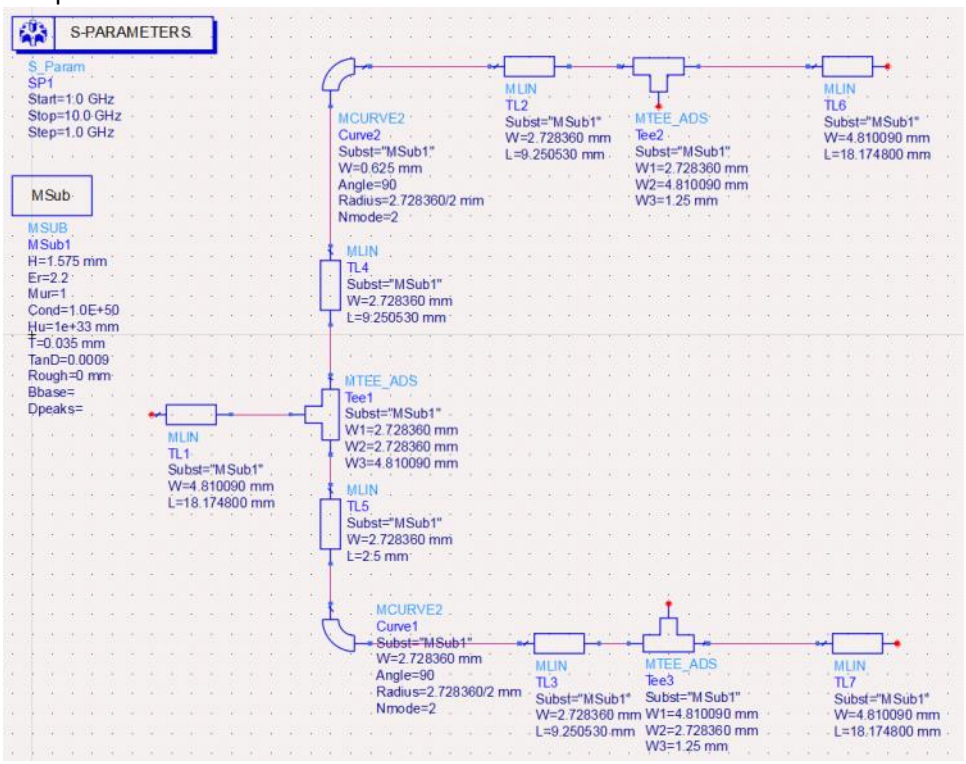
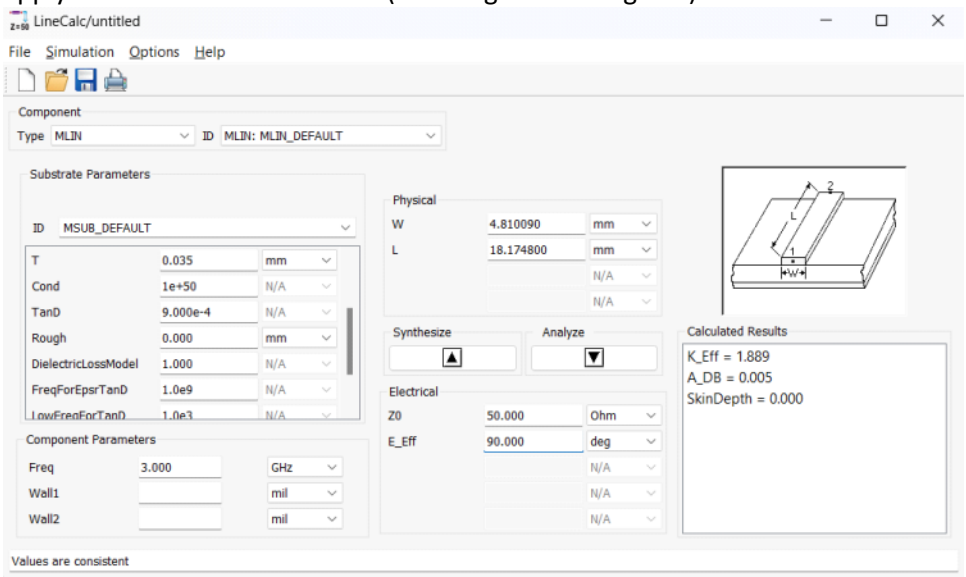
RF and Microwave (ADS) Lab 3 Steps

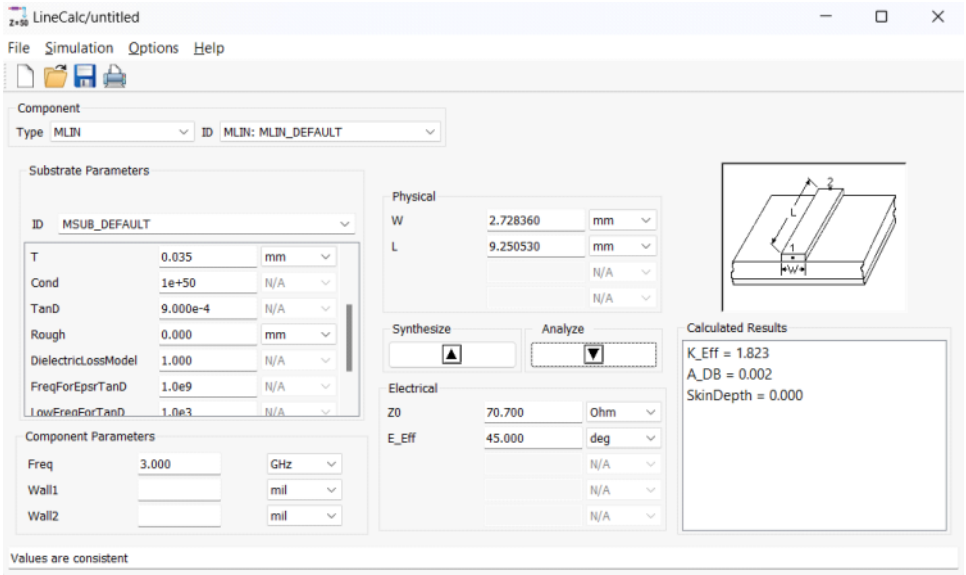
Submitted by **Saurabh Kumar**
(SC22B146)

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.

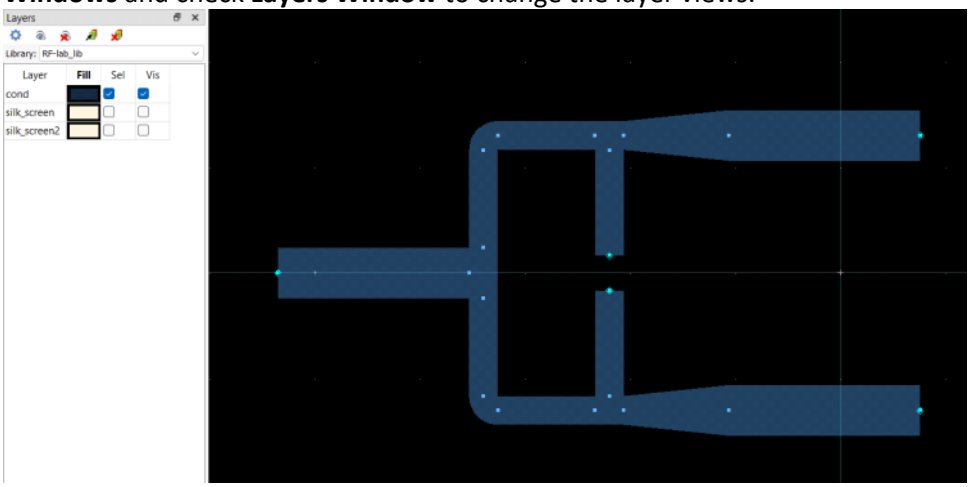


   b. Calculate their desired width and lengths using **LineCalc** tool with the entries as shown in MSub component. The widths of branch of an MTEE will be same as the width of MLIN it is facing. Same will apply for the radius of MCURVE (with angle of 90 degrees).

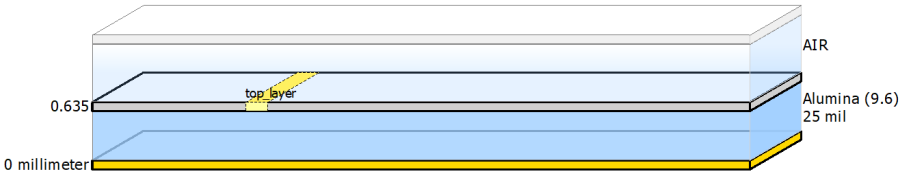




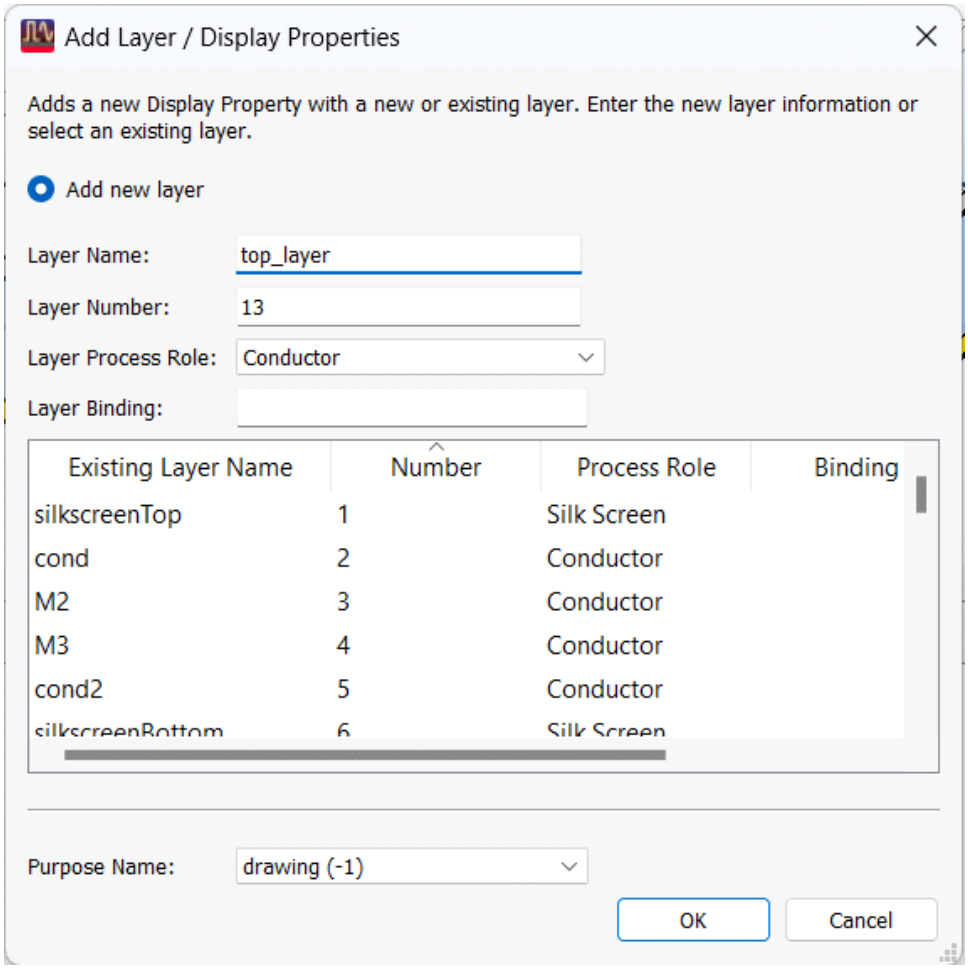
c. Go to **Layout** tab -> **Generate/Update Layout** -> **Ok** to get the **Layout** window. Go to **View -> Docking Windows** and check **Layers Window** to change the layer views.



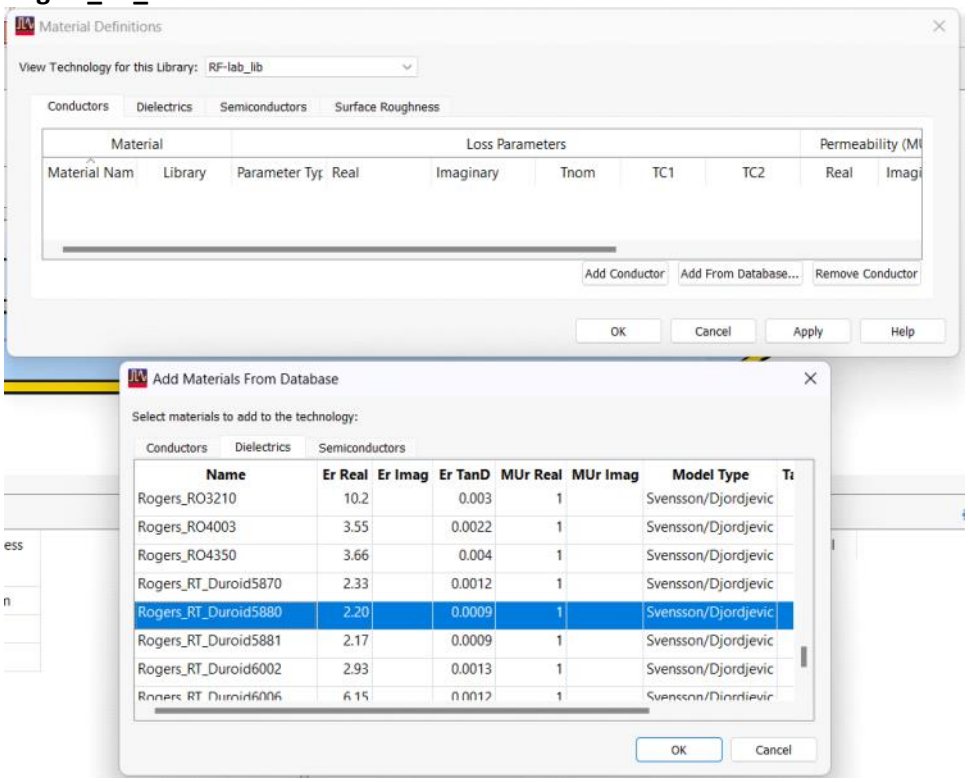
d. Click on **Substrate Editor** to open it.



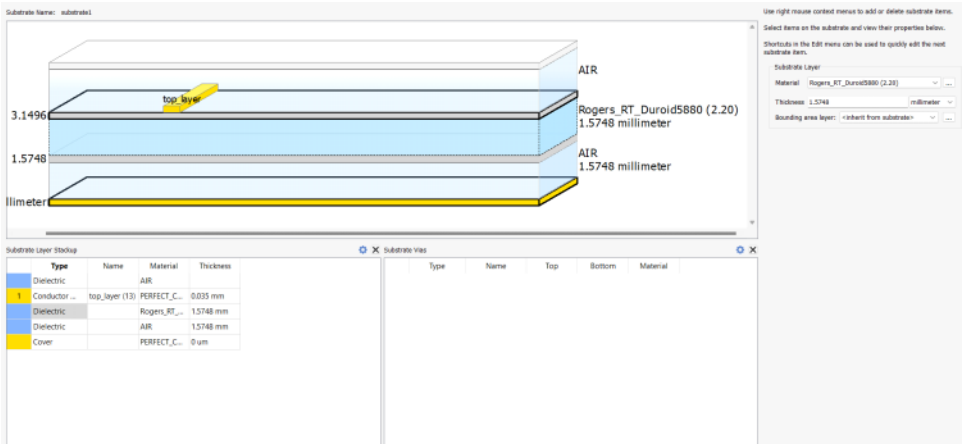
e. Add a new layer named **top_layer**.



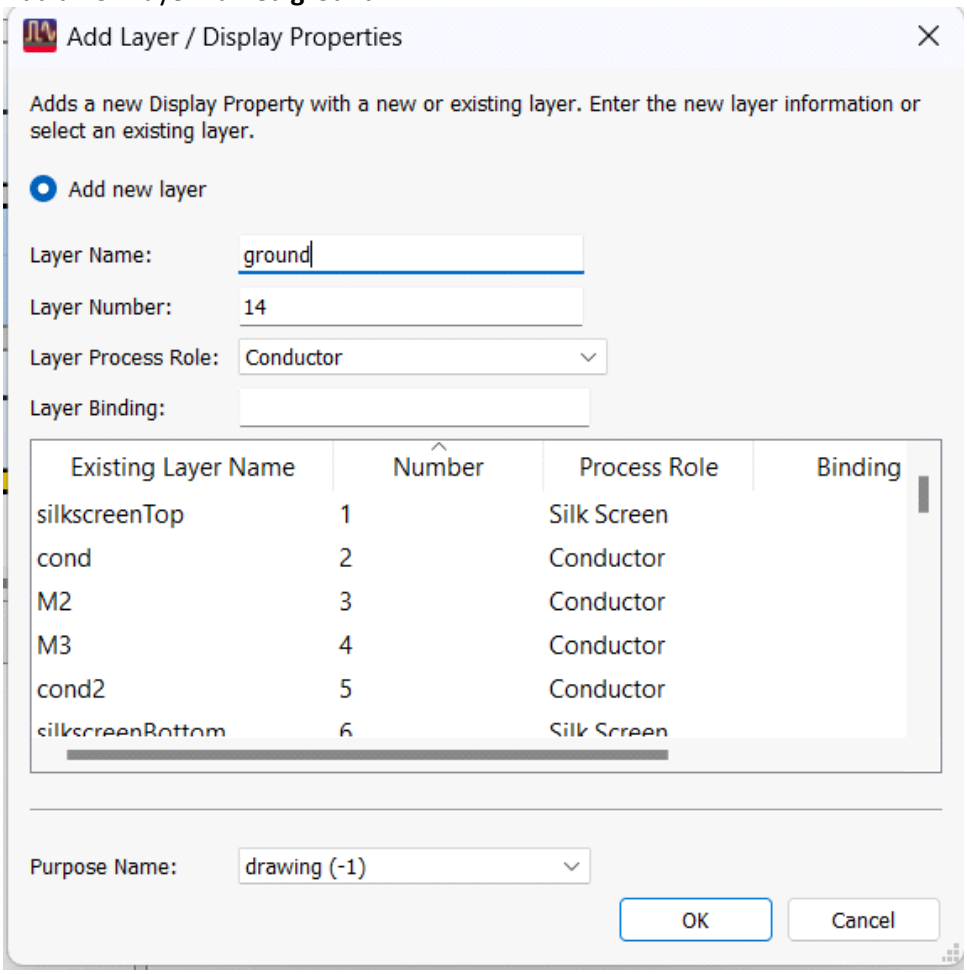
f. Select the substrate and click on **…** beside **Material**. Then, click on **Add From Database** and select **Rogers_RT_Duroid5880** from the **Dielectrics** tab.



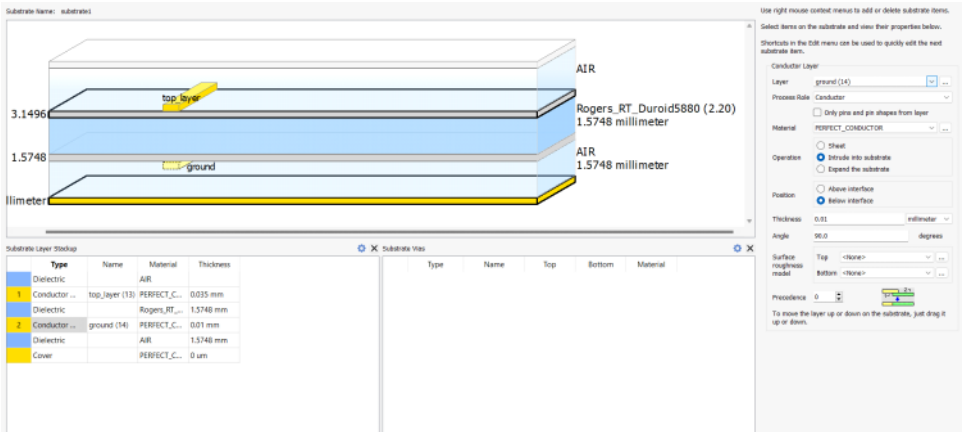
g. Set the material to **Rogers_RT_Duroid5880** and thickness to 1.5748 mm.



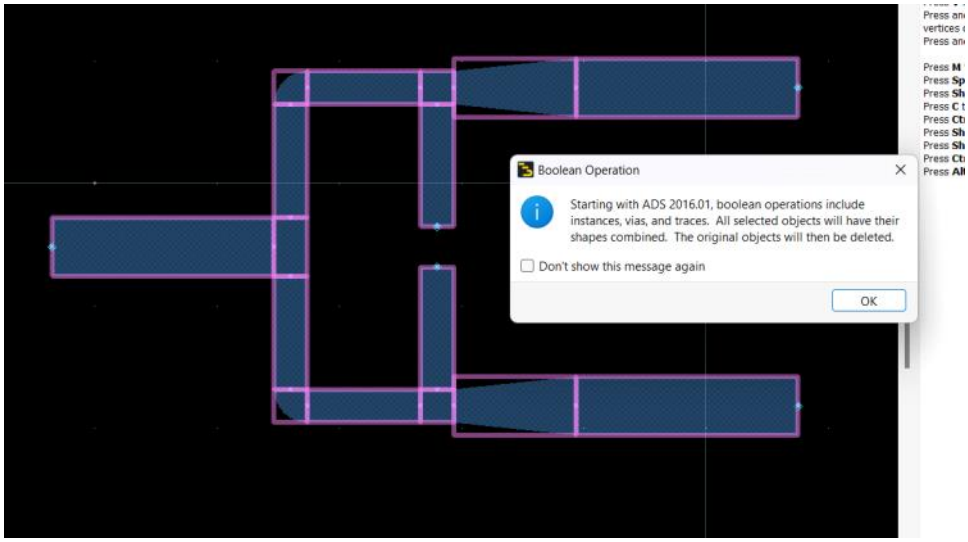
h. Add a new layer named **ground**.



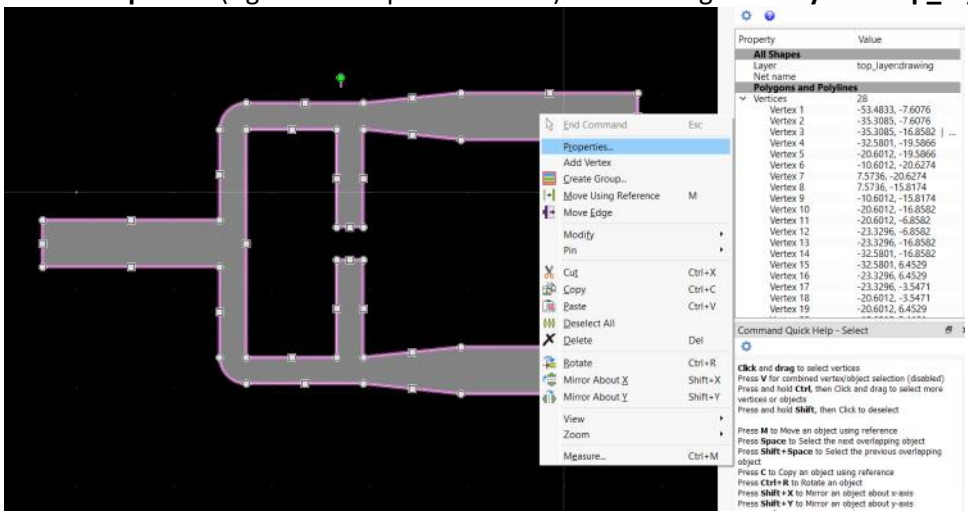
i. Select ground (14) operation to **Intrude into substrate** and position to **Below interface**.



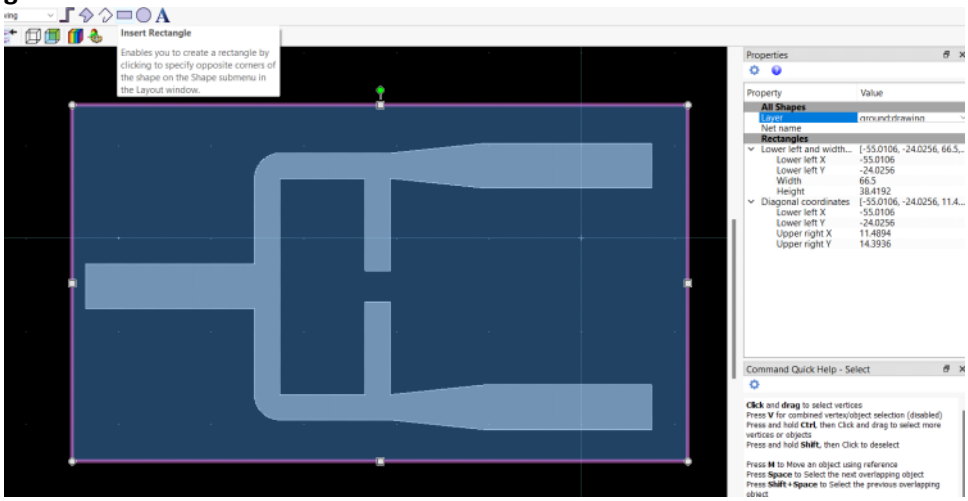
j. Select all and **shift+U** to unite.



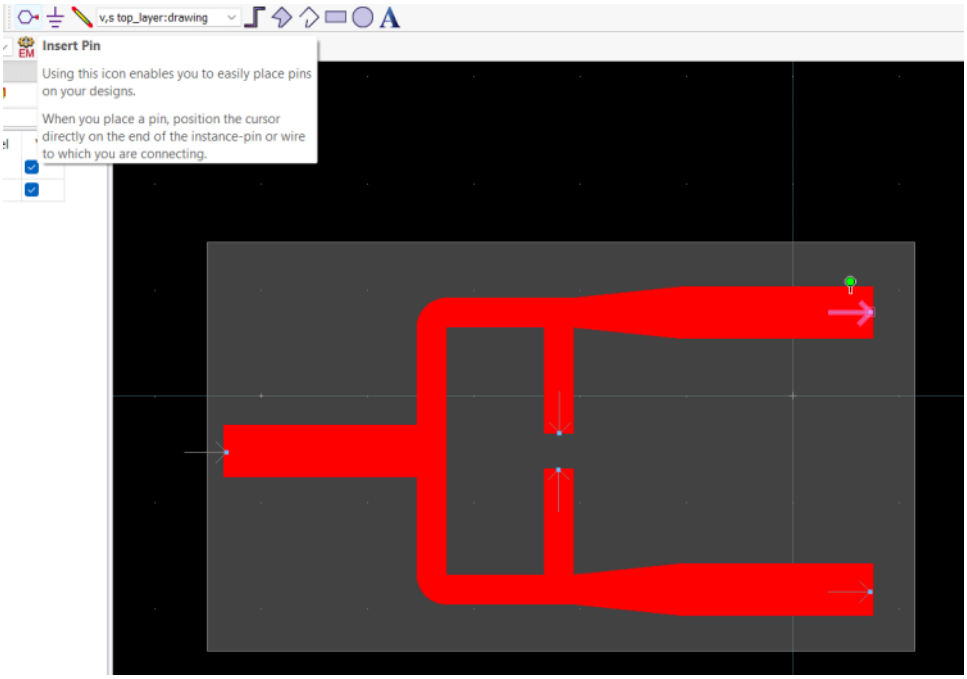
k. Got to **Properties** (right click on power divider). Then change the **Layer** to **top_layer:drawing**.



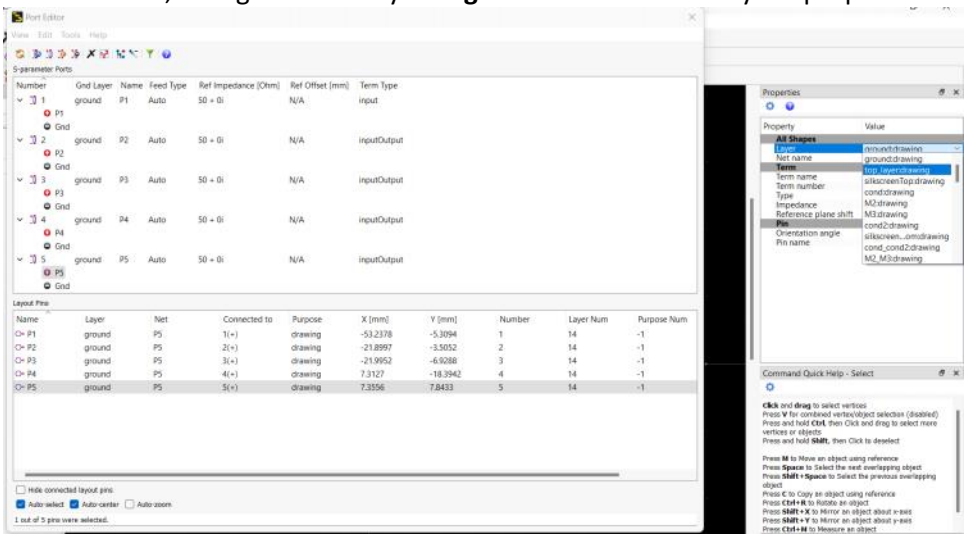
l. Draw a rectangle such that it covers the complete power divider, and change its Layer property to **ground**.



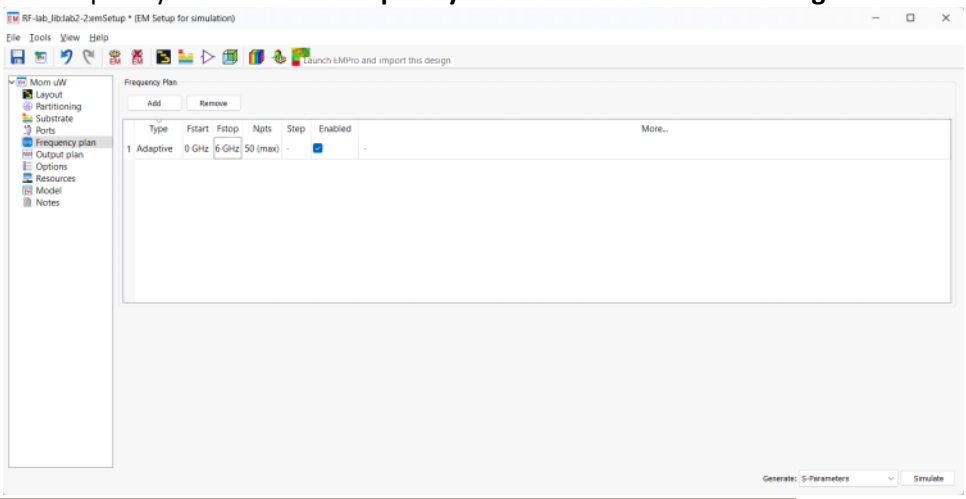
m. Make the ports using **Insert Pin** tool.



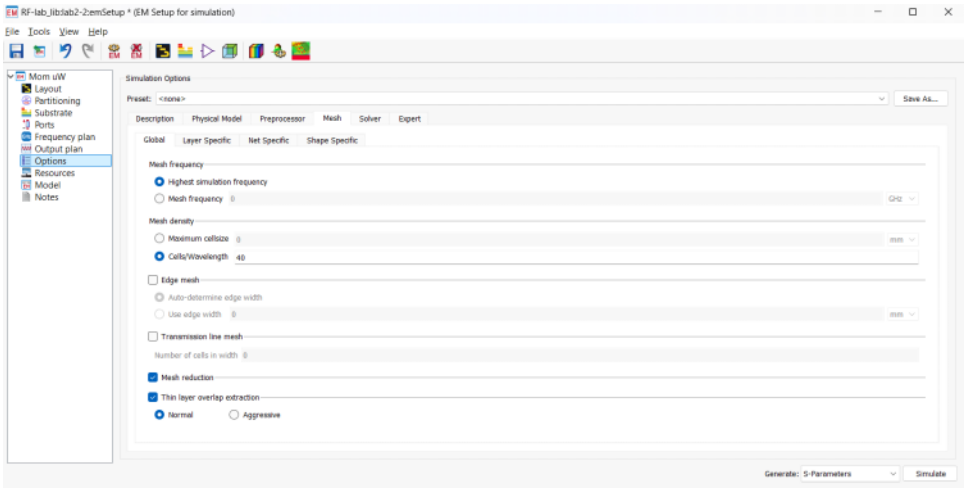
n. In **Port Editor**, change all Gnd Layer to **ground** and select all layer's properties as **top_layer**.



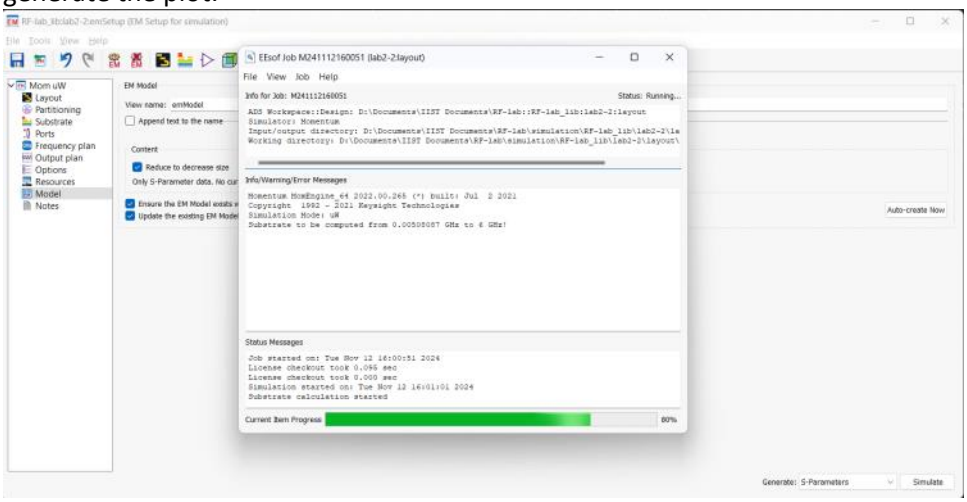
o. Set frequency 0 to 6 GHz in **Frequency Plan** in **EM Simulation Settings** window.

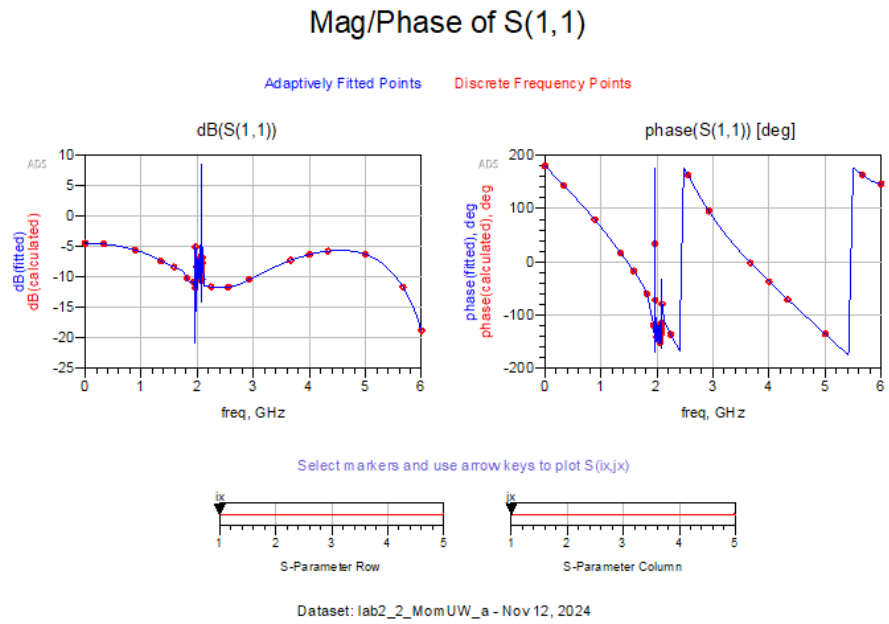


p. Change Cells/Wavelength from 20 to **40** under **Mesh** in **Options**.

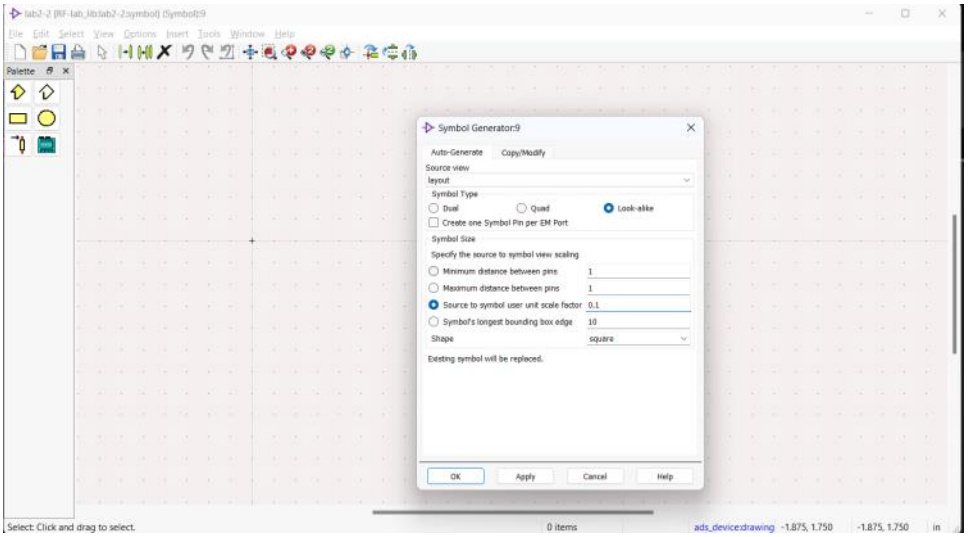


q. Tick **Ensure the EM Model exists** when the simulation is launched in Model and Simulate and generate the plot.

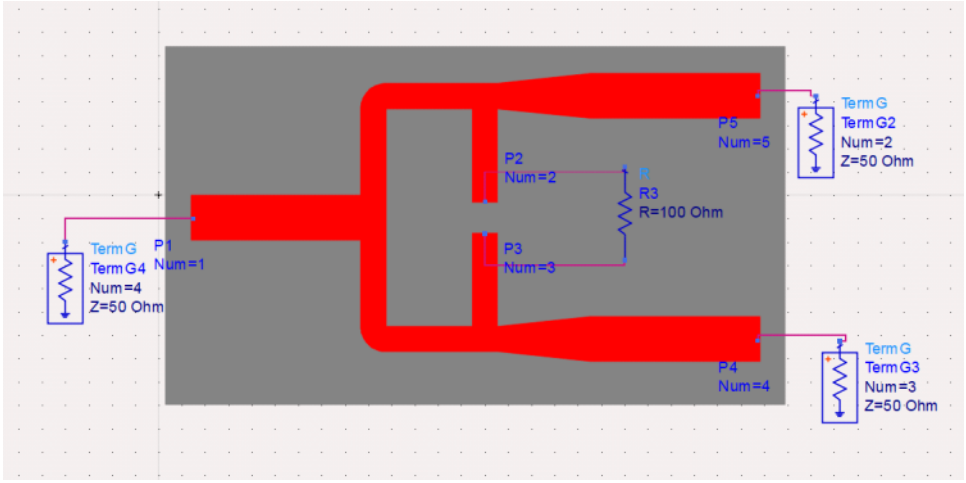




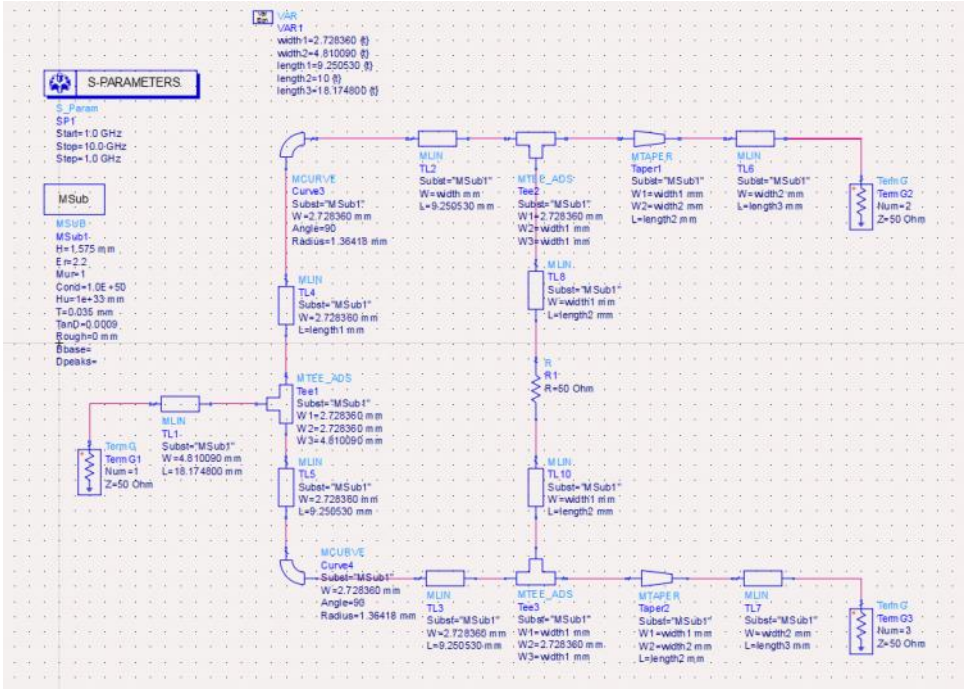
r. After the simulation is done, go to **EM -> Component -> Create EM Model and Symbol.**



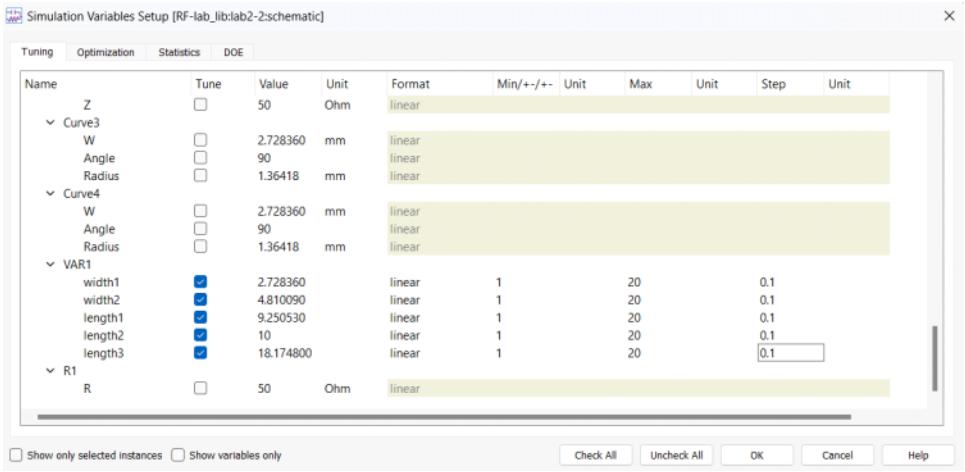
s. Copy the symbol to a new schematic and add the **TermG** components to the ports of the power divider.



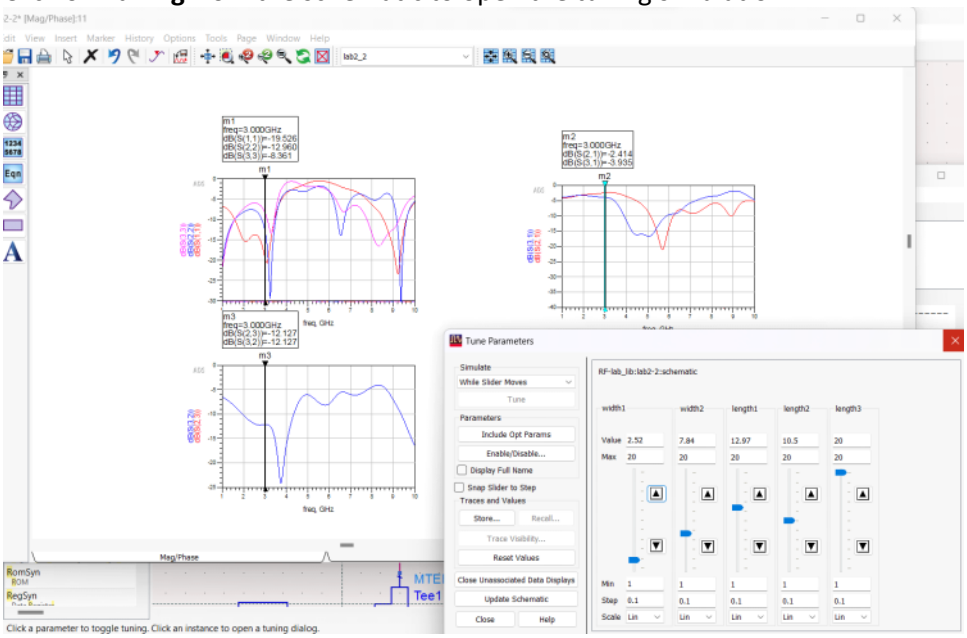
t. Add a **VAR** component and add the variables with their respective values to tune them.

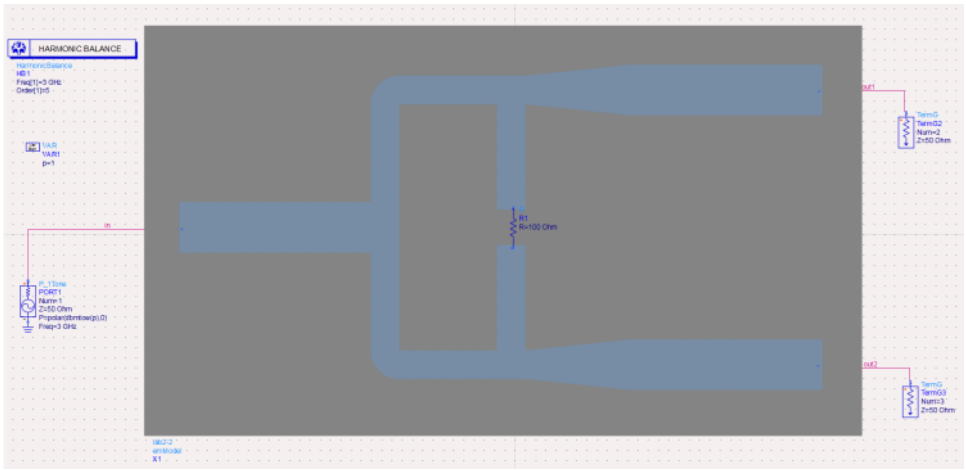


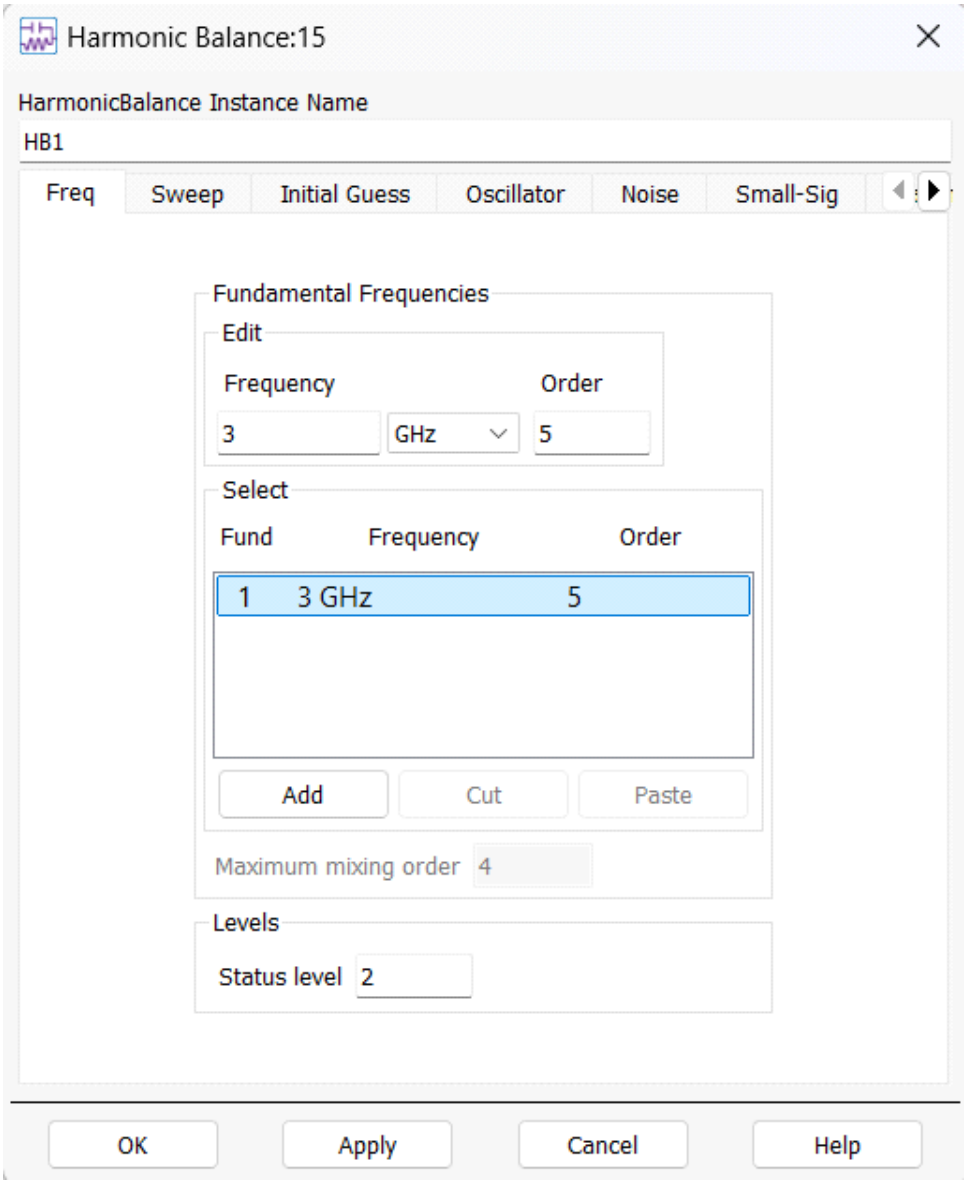
u. Open **the Simulation Variable Setup** window from the Simulate tab. Setup the variables to be tuned with min/max and step values.

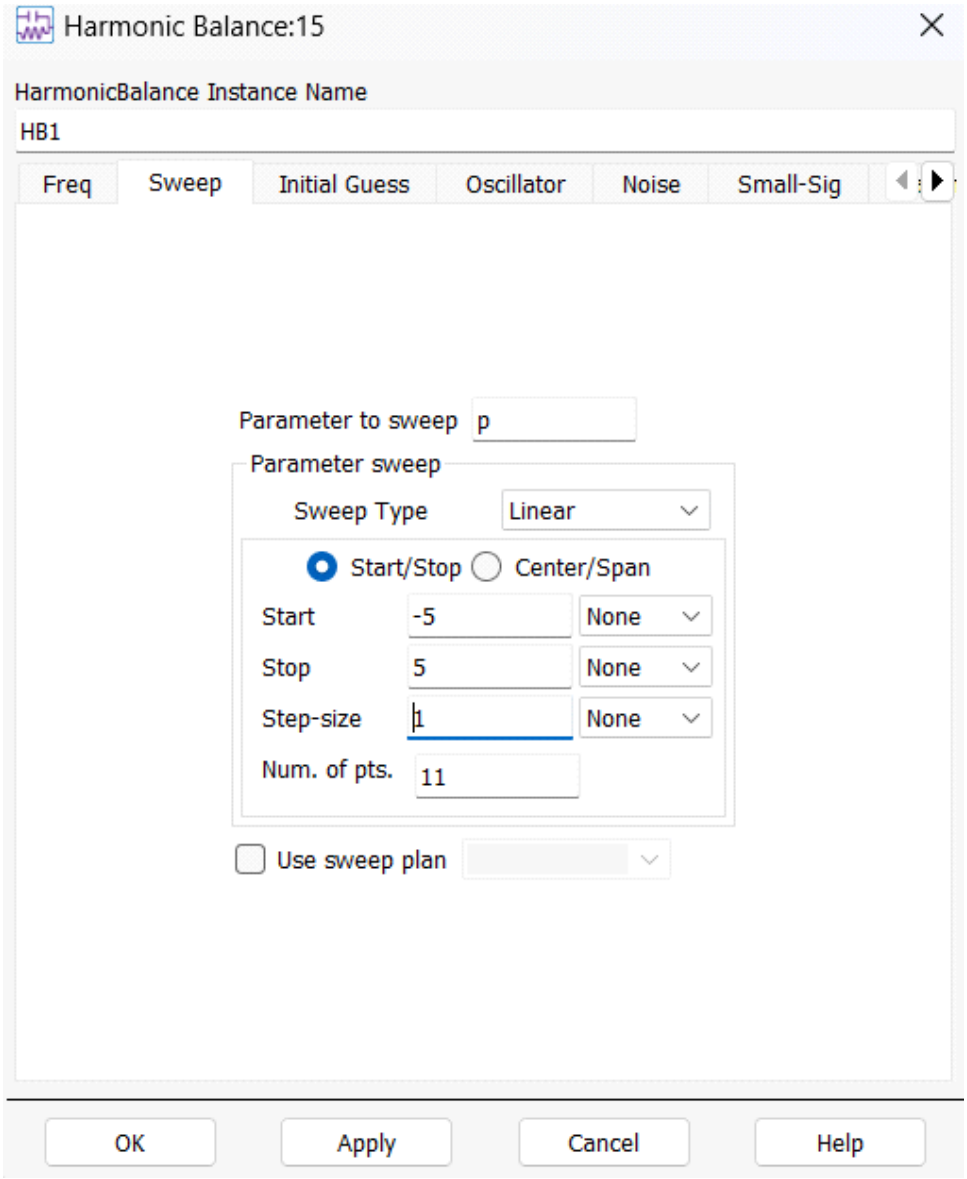


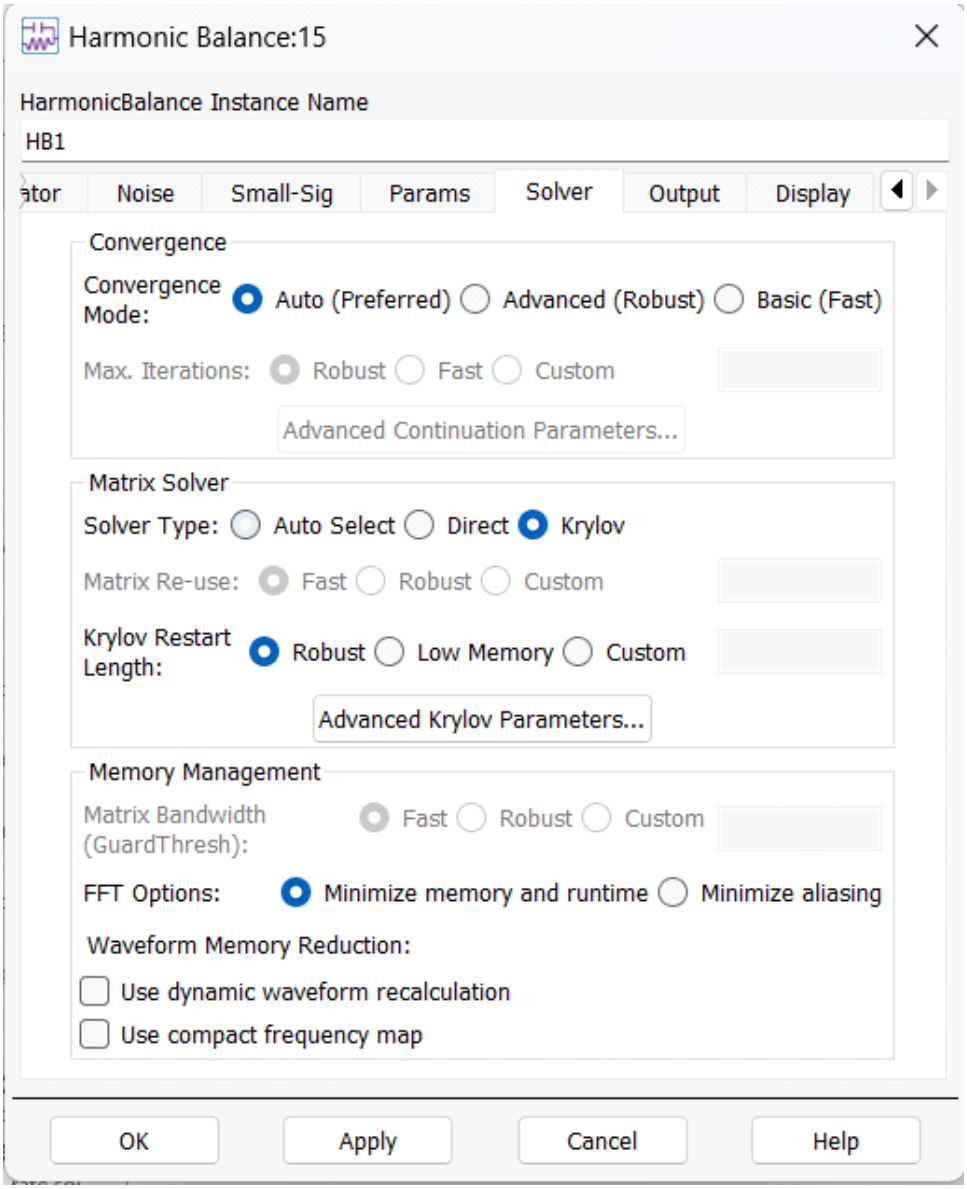
V. Click on **Tuning** from the schematic to open the tuning simulation.

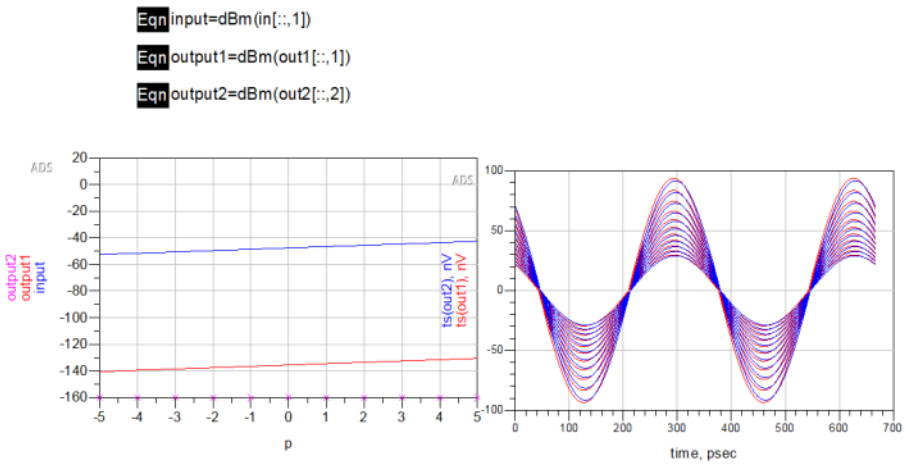





Harmonic Balance:15
HarmonicBalance Instance Name
HB1
Freq
Sweep
Initial Guess
Oscillator
Noise
Small-Sig
Fundamental Frequencies
Edit
Frequency
Order
3
GHz
5
Select
Fund
Frequency
Order
1
3 GHz
5
Add
Cut
Paste
Maximum mixing order
4
Levels
Status level
2
OK
Apply
Cancel
Help


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])
ADS
output2
output1
input
ts(out2), nV
ts(out1), nV
p
time, psec