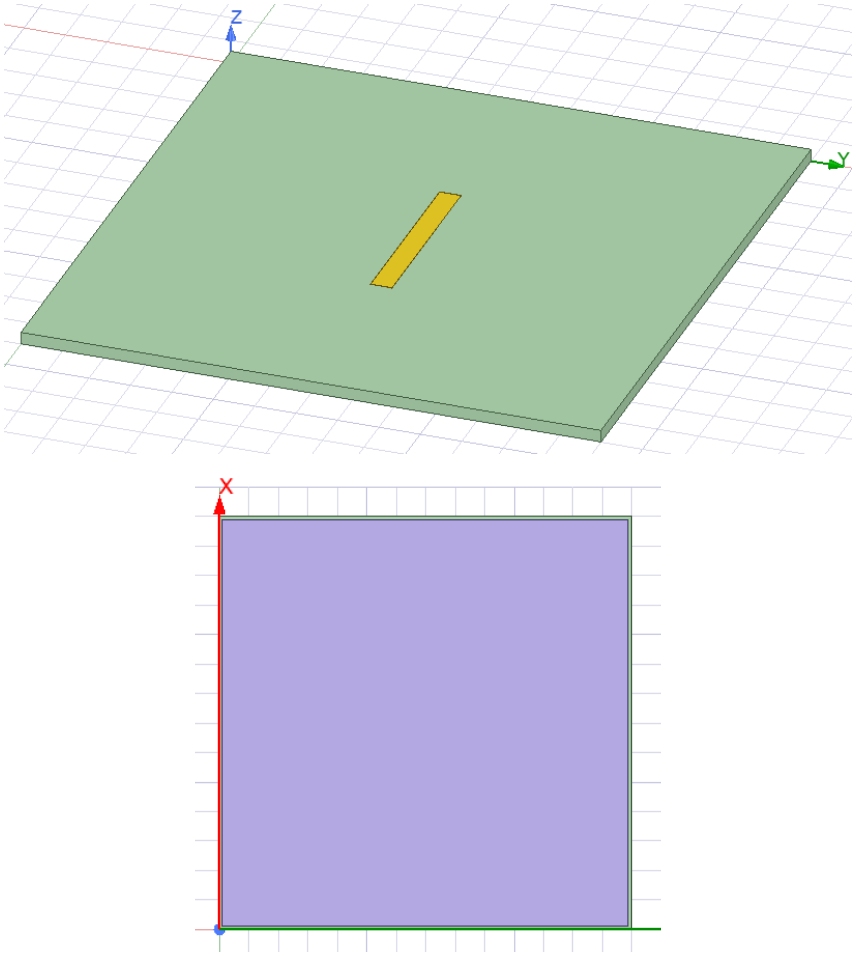
TRANSMISSION LOSS SIMULATION WITH ANSYS ELECTRONICS DESKTOP

The main goal of this project is measure the transmission loss of different electromagnetic shielding materials. To do this, it is necessary measure the S21 with the material pasted on the microstrip.

First of all, I have measured the S21 of one material (pasted on the microstrip) with the Network Analyzer and it will be compared with the results obtained with the simulation.

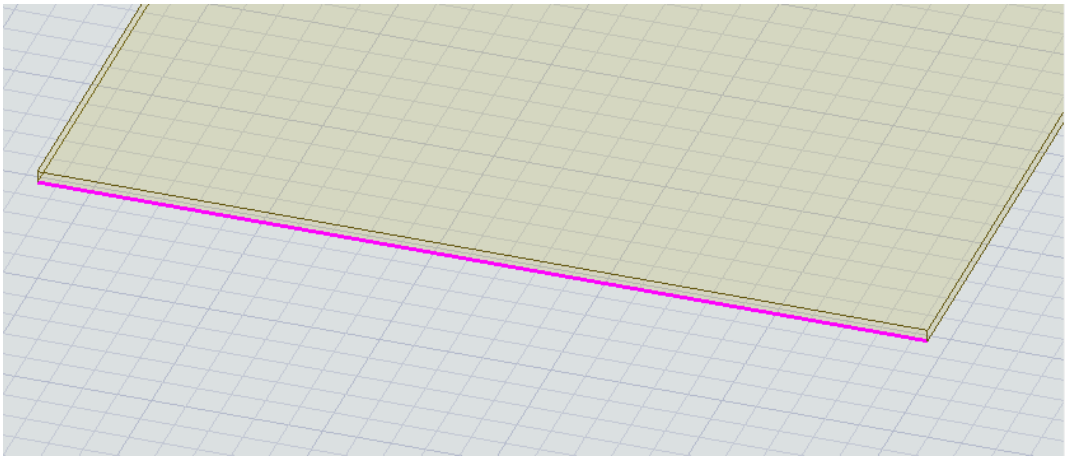
1. - Design of the microstrip



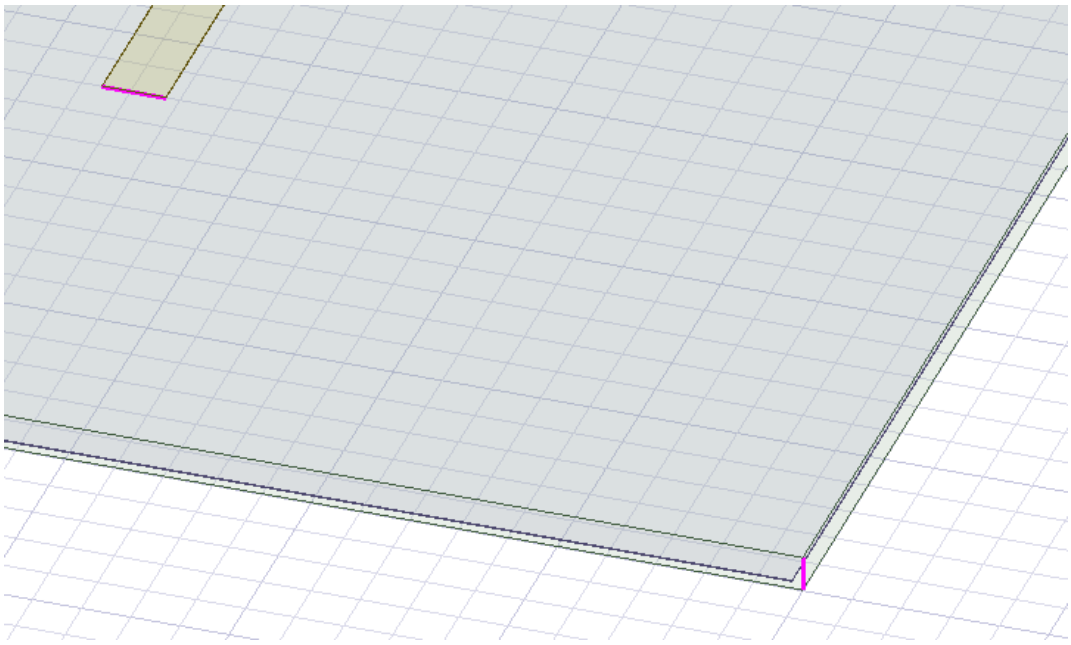
The impedance of the microstrip is 50Ω. The material of ground plane is copper.

2. - Design of the ports

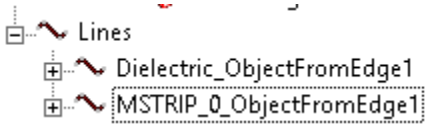
2.1.1 Select the bottom edge of the microstrip.



2.1.2 Select the height of the substrate.

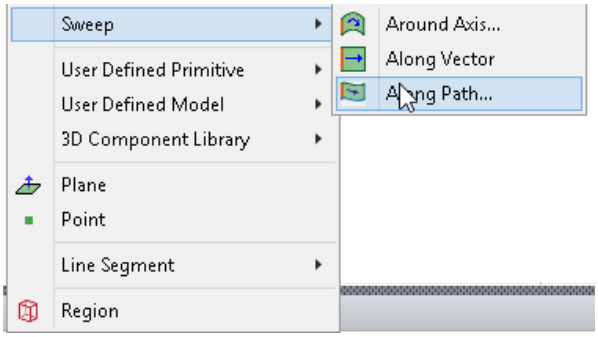


2.1.3 Create Object from Edge.

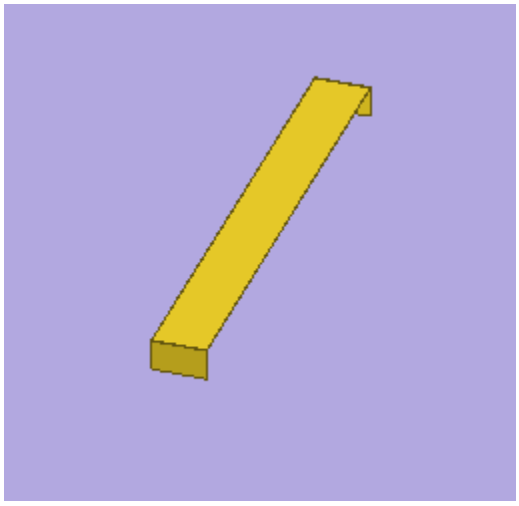


I select first Mstrip_0_ObjectFromEdge1 and after Dielectric_ObjectFromEdge1

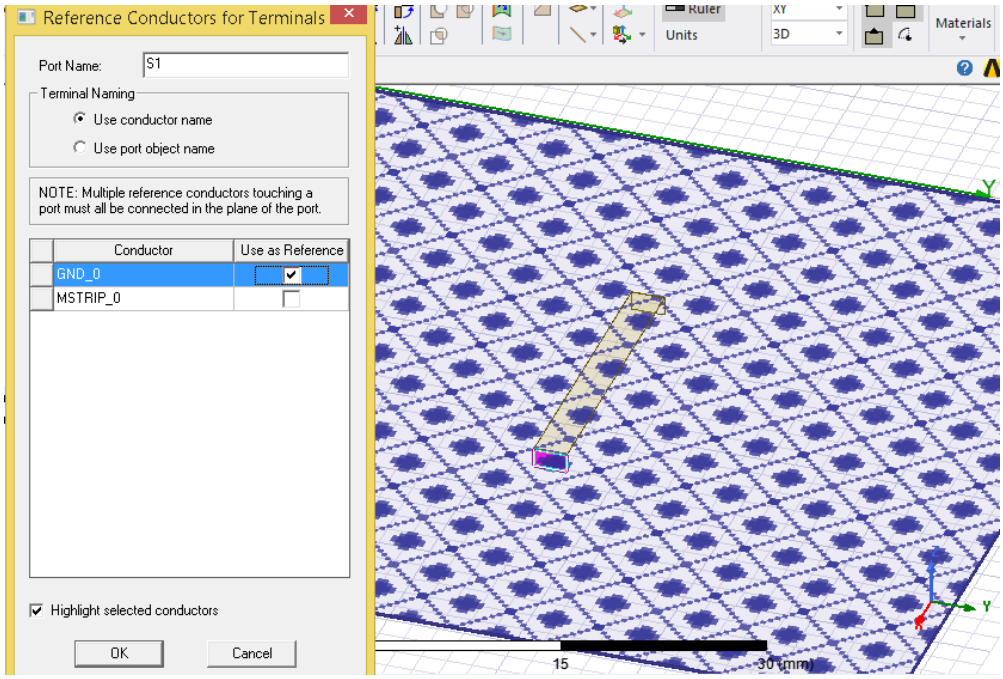
2.1.4 Draw-> Sweep-> Along Path..



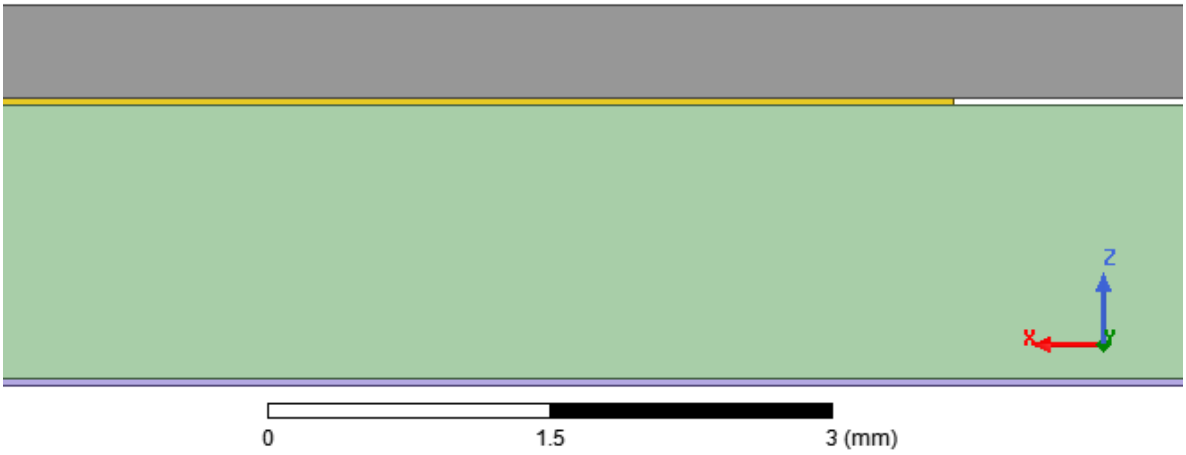
I repeat the same procedure for the second port.



After that, I assign the excitation to the ports. I'm going to use lumped ports. I use as reference the ground plane for both ports. **¿IT IS CORRECT?**



3. – Design of the electromagnetic shielding material



The shielding material is just above of the microstrip, like it can observed on the previous figure.

I have defined the material using his permeability and his magnetic loss tangent.

Material Name

3441

Properties of the Material

	Name	Type	Value	Units
	Relative Permittivity	Sim...	1	
	Relative Permeab...	Sim...	pwl($Perm_3441,Freq)	
	Bulk Conductivity	Sim...	0	siemen...
	Dielectric Loss T...	Sim...	0	
	Magnetic Loss T...	Sim...	pwl($Tangloss_3441...	
	Magnetic Saturati...	Sim...	0	tesla
	Lande G Factor	Sim...	2	
	Delta H	Sim...	0	A_per...
	- Measured Freq...	Sim...	3	GHz
	Mass Density	Sim...	0	kg/m^3

View/Edit Material for

- (•) Active Design
- ( ) Active Project
- ( ) All Properties

Physics:

- [x] Electromagnetic
- [ ] Thermal
- [ ] Structural

View/Edit Modifier for

- [ ] Thermal Modifier

Material Appearance

- [ ] Use Material Appearance

Color:

Transparency:

Notes ...

Set Frequency Dependency... | Calculate Properties for: | Validate Material

Reset | OK | Cancel

Name: $Perm_3441 | Swap X-Y Data | Import Dataset... | Export Dataset...

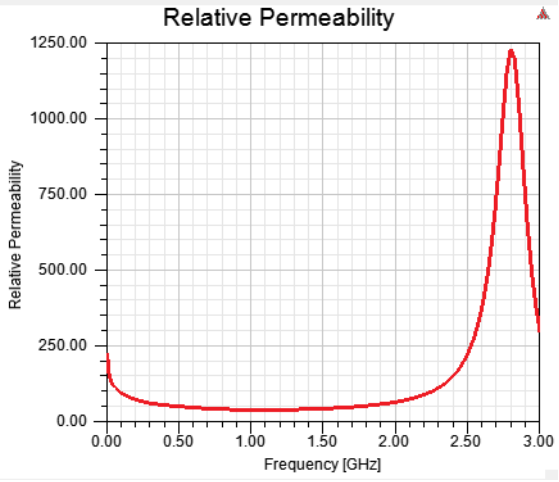
Coordinates

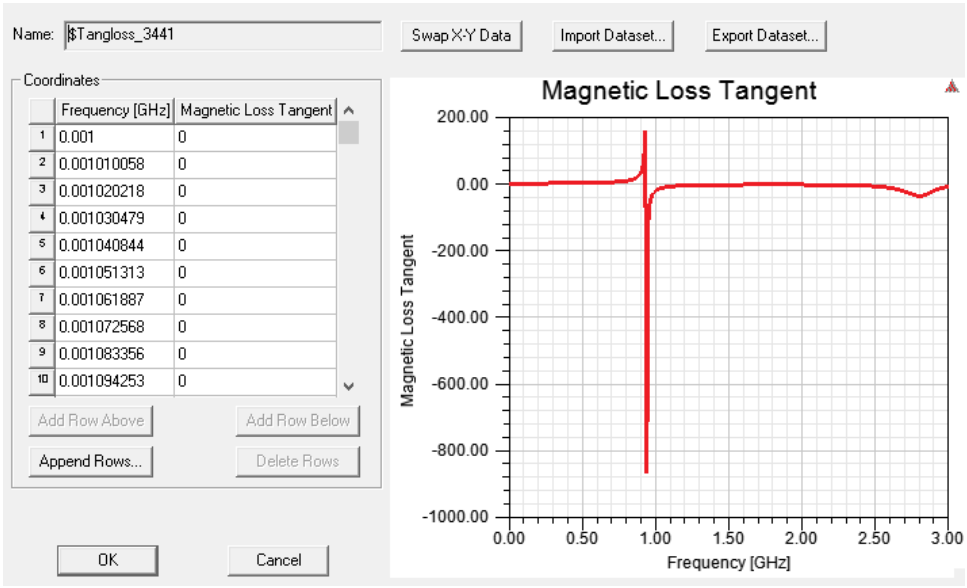
	Frequency [GHz]	Relative Permeability
1	0.001	218.0352518
2	0.001010058	218.0352518
3	0.001020218	217.8150038
4	0.001030479	218.394398
5	0.001040844	218.9061528
6	0.001051313	220.1281132
7	0.001061887	220.0650772
8	0.001072568	219.4414311
9	0.001083356	219.5762575
10	0.001094253	219.5067442

Add Row Above | Add Row Below

Append Rows... | Delete Rows

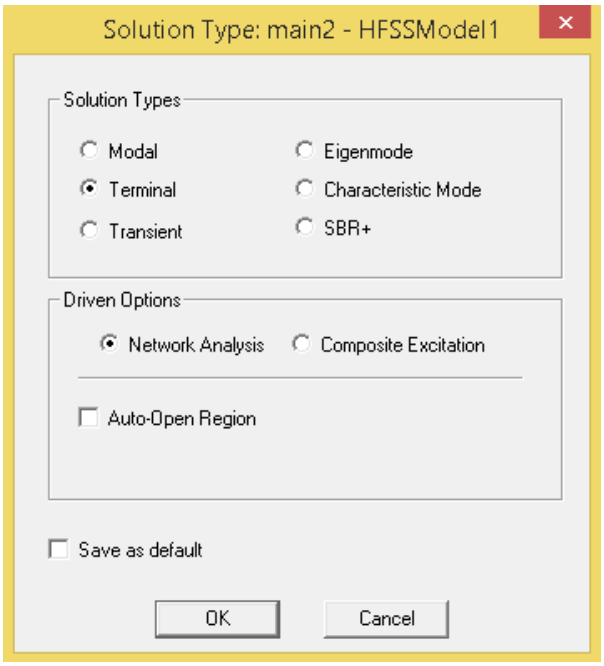
OK | Cancel





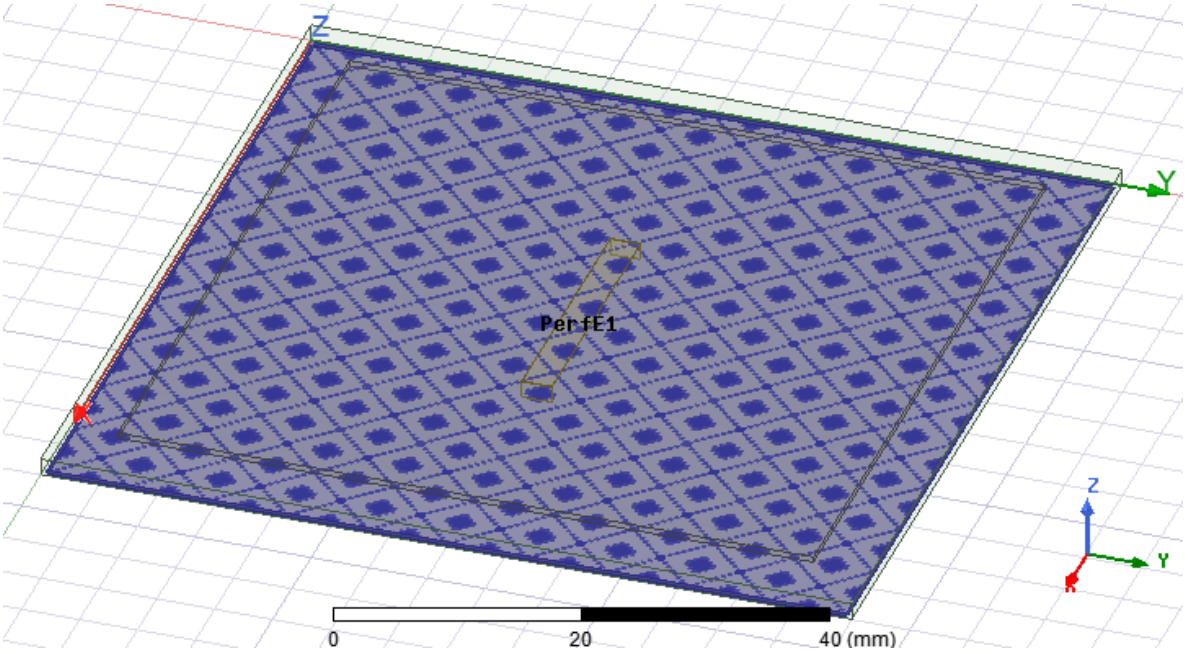
- DOUBT: IF IM GOING TO MEASURE FOR EXAMPLE THE RANGE 1GHZ- 3GHZ I MUST CHANGE THE MEASURED FREQUENCY OF ALL MATERIALS: COPPER, ELECTROMAGNETIC SHIELDING MATERIAL, DIELECTRIC.... OR IT DOES NOT MATTER?

4. – Solution type

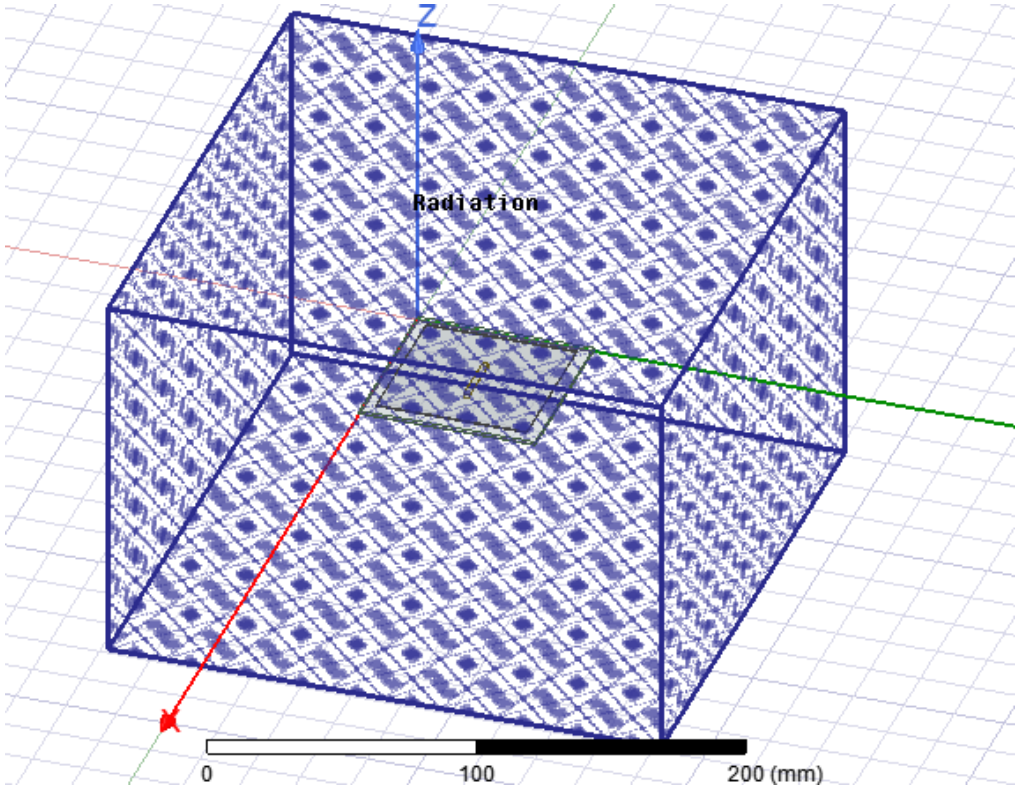


5. – BOUNDARIES

5.1.1 PERFECT E BOUNDARY FOR GND PLANE

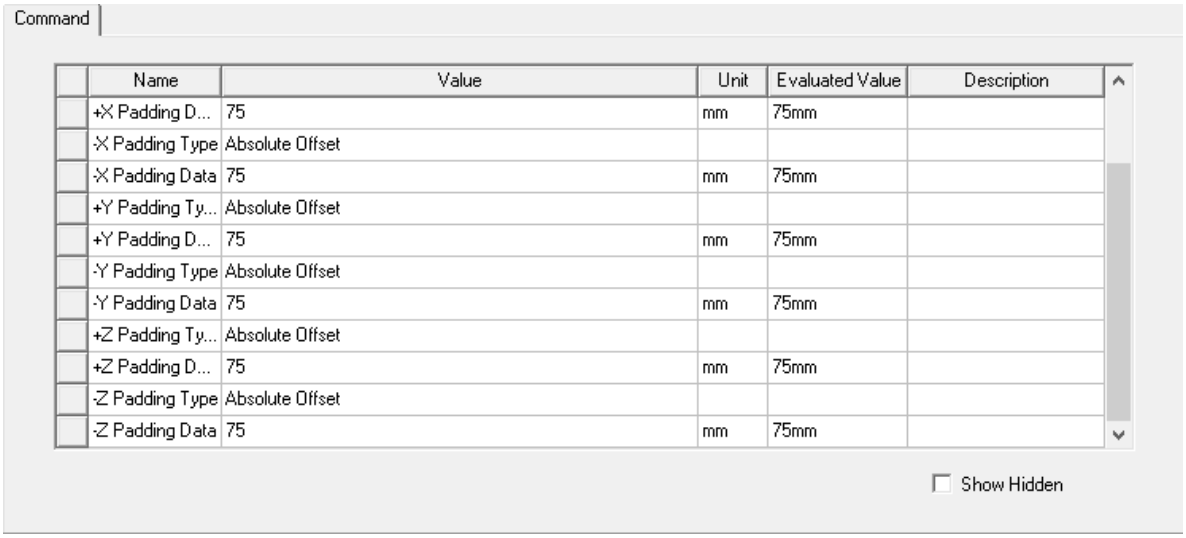


5.1.2 RADIATION BOUNDARY



6. – RADIATION BOX AND ANALYSIS SETUP.

6.1.1 RADIATION BOX

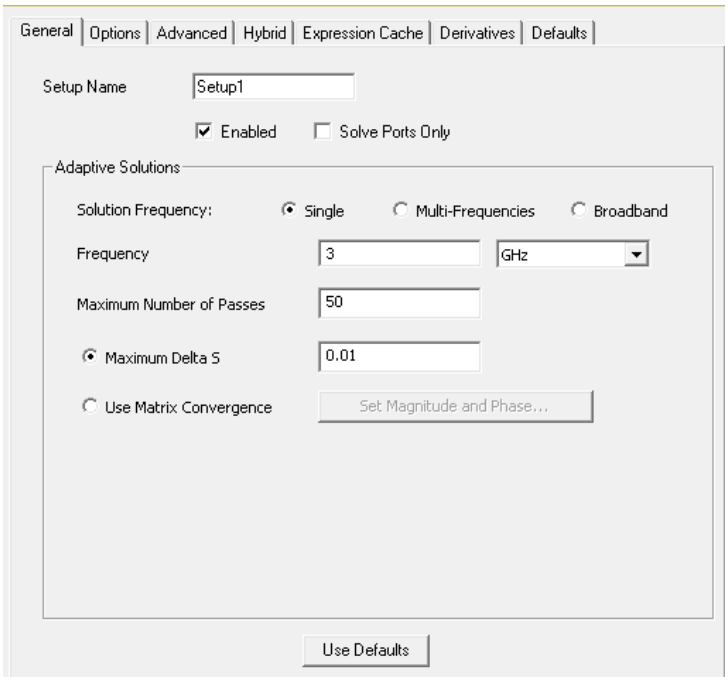


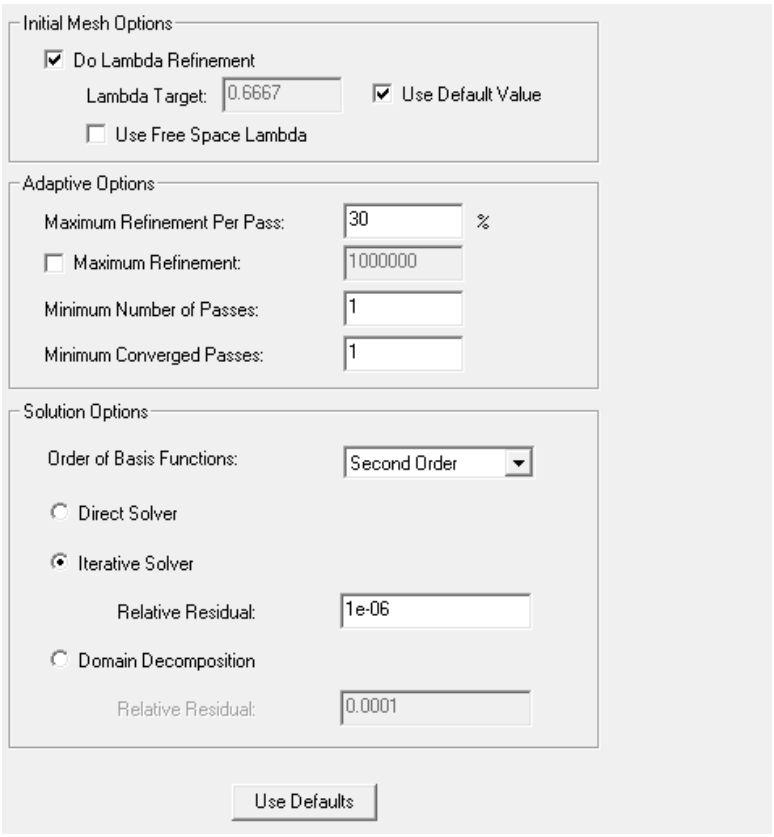
I HAVE CALCULATED λ/4 OF 1GHZ AND I HAVE OBTAINED 75mm.

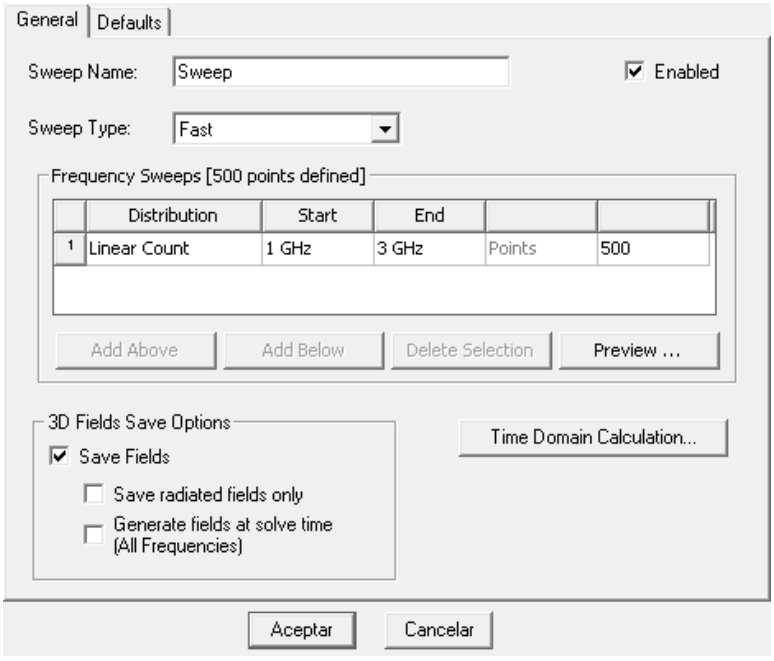
$$\boldsymbol{\lambda = \frac{C}{F} = \frac{3.10^8}{1.10^9} = 300\ mm}$$

$$\boldsymbol{\frac{\lambda}{4} = 75\text{mm}}$$

6.1.2 ANALYSIS SETUP




Initial Mesh Options
Do Lambda Refinement
Lambda Target: 0.6667
Use Default Value
Use Free Space Lambda
Adaptive Options
Maximum Refinement Per Pass: 30 %
Maximum Refinement: 1000000
Minimum Number of Passes: 1
Minimum Converged Passes: 1
Solution Options
Order of Basis Functions: Second Order
Direct Solver
Iterative Solver
Relative Residual: 1e-06
Domain Decomposition
Relative Residual: 0.0001
Use Defaults


General
Defaults
Sweep Name: Sweep
Enabled
Sweep Type: Fast
Frequency Sweeps [500 points defined]
Distribution
Start
End
1
Linear Count
1 GHz
3 GHz
Points
500
Add Above
Add Below
Delete Selection
Preview ...
3D Fields Save Options
Save Fields
Save radiated fields only
Generate fields at solve time (All Frequencies)
Time Domain Calculation...
Aceptar
Cancelar

7. – EDIT SOURCES.

Spectral Fields | Source Contexts

	Source	Type	Magnitude	Unit	Phase	Unit
1	MSTRIP_0_T1	Port	1	V	0	deg
2	MSTRIP_0_T2	Port	0	V	0	deg

Terminal Excitation Type: (•) Incident Voltage ( ) Total Voltage

[ ] Include Port Post Processing Effects

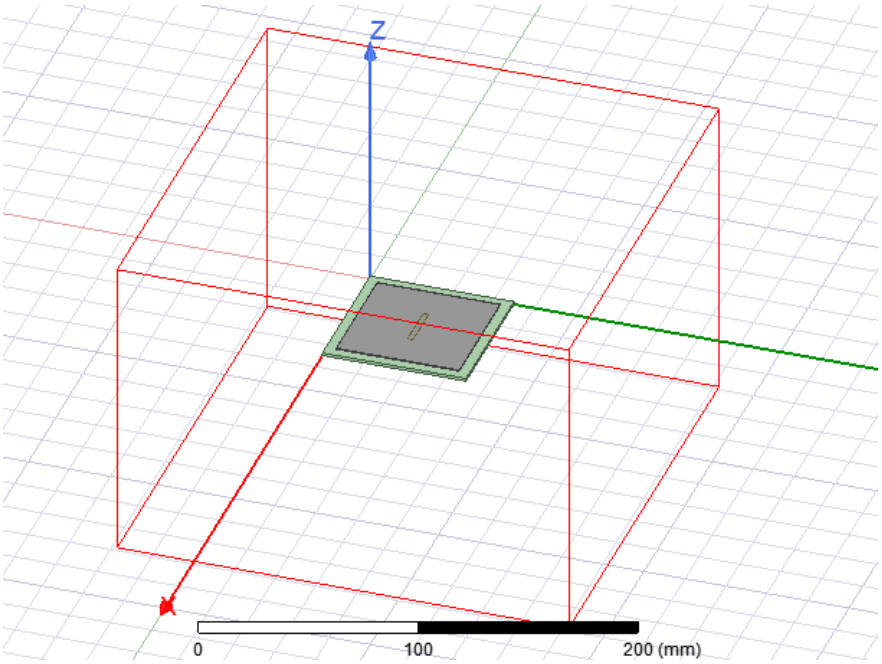
System power for gain calculations:

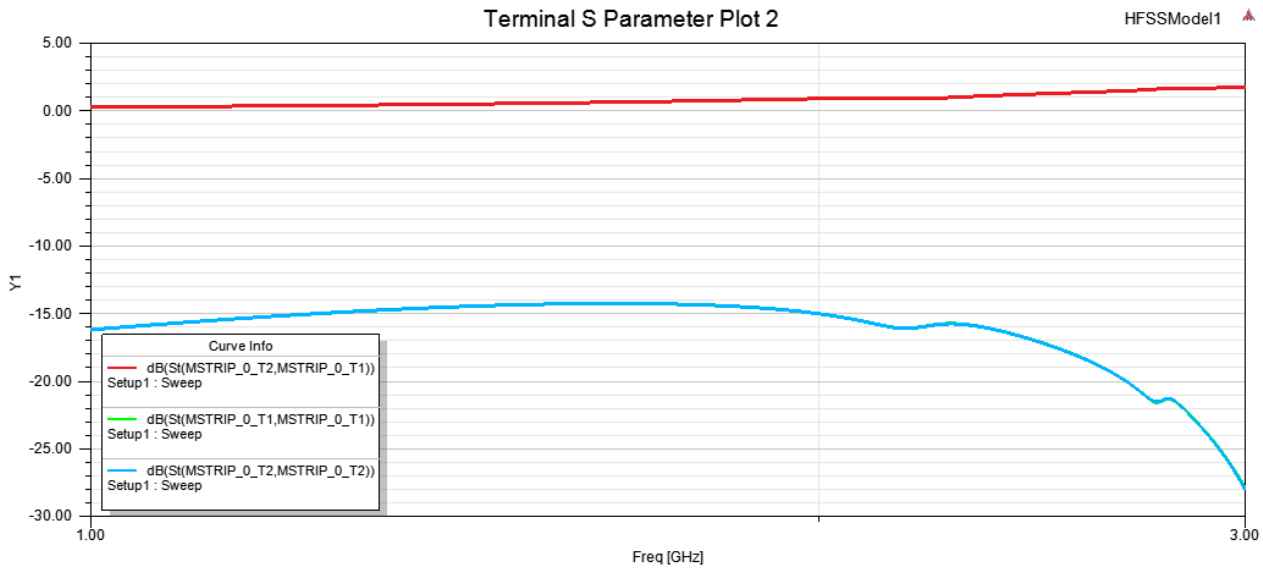
( ) Specify System Power: 1 W

(•) Use Maximum Available Power

- **DOUBT: IF I'M GOING TO MEASURE S21, I INTERPRET THAT I MUST ESTIMULATE PORT ONE LIKE ON THE FIGURE BUT WHAT MEANS THAT THE PORT 2 HAS MAGNITUDE 0?**

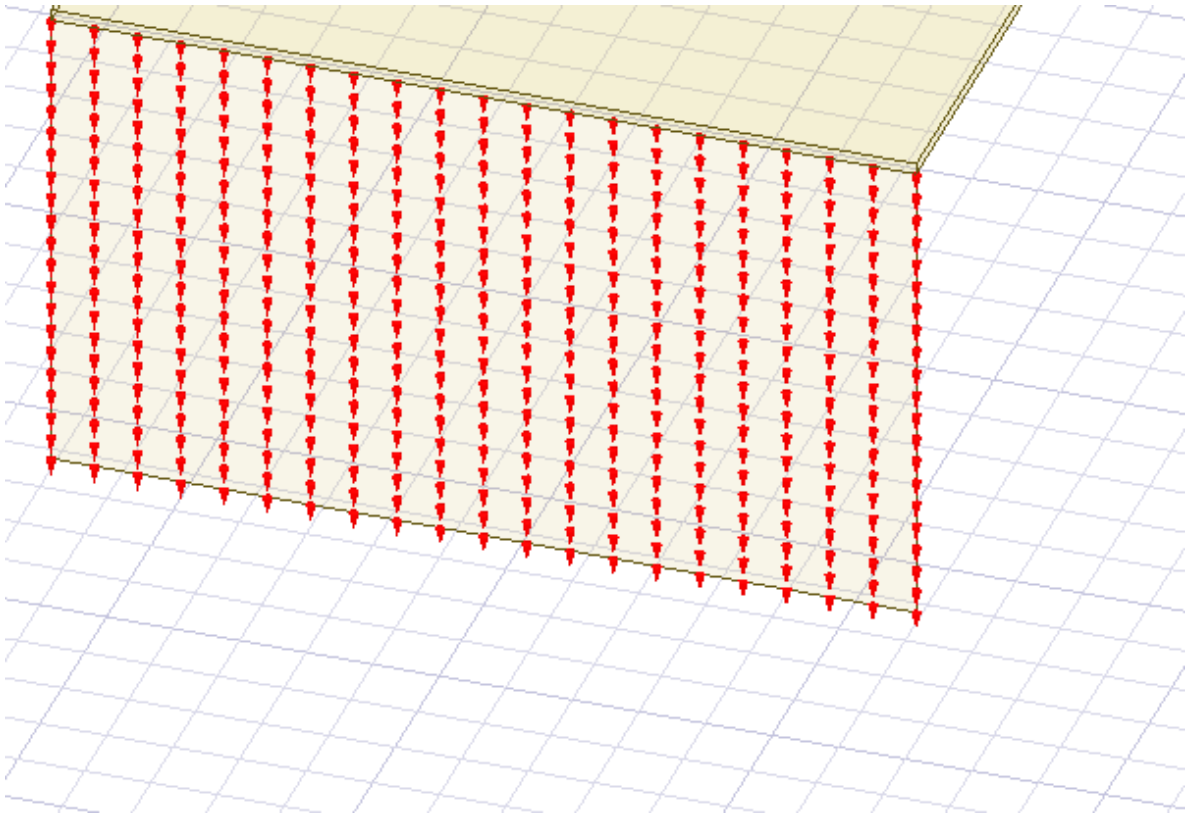
8. – RESULTS.





TRACES S11 AND S22 ARE EQUALS, IT IS CORRECT?

THE FIELD OF THE PORTS ARE:



IT IS CORRECT? OR I MUST DEFINE THE PORTS OF DIFFERENT WAY?

THE RESULT THAT I HAVE MEASURED WITH THE NETWORK ANALYZER IS: