5/2020

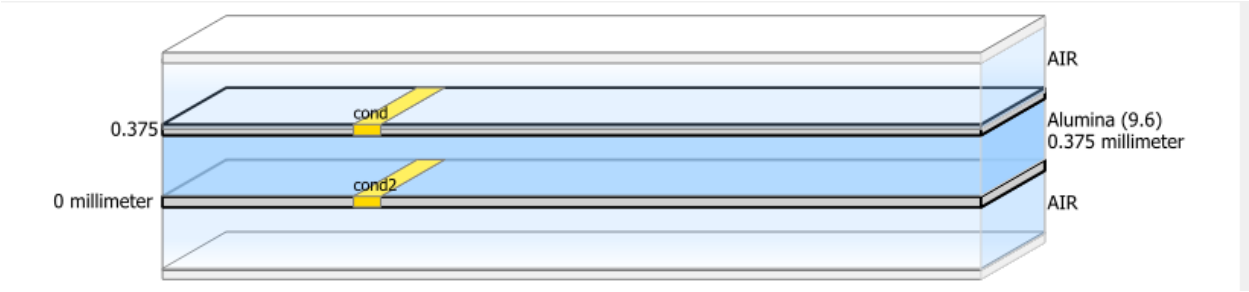
ENS201 – TERM PROJECT

Batuhan KARABAĞLI 22293

My student id is **22293** accordingly my capacitance will be **22.2 pF** and my frequency will be around **293 MHz**.

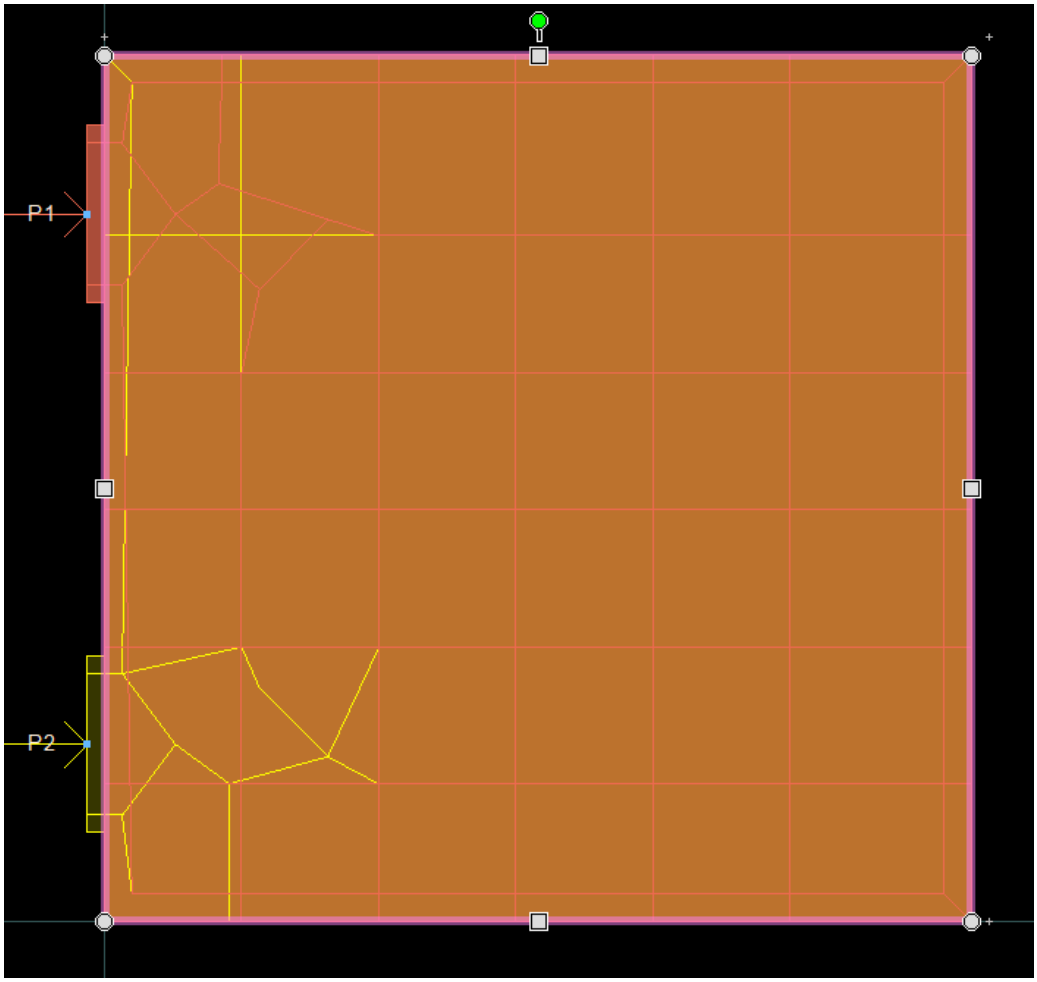
Firstly I started with calculation of area my with formula C = (ε.A) / d. ε0 is **8.854e-12**, ε is 9.6 for alumina and distance between plates is **0.375mm**. Thus my area is **97,9e-6m^2** and it is **9.8*9.8mm** sides.

TASK-1 (Perfect Conductor- Perfect Insulator):

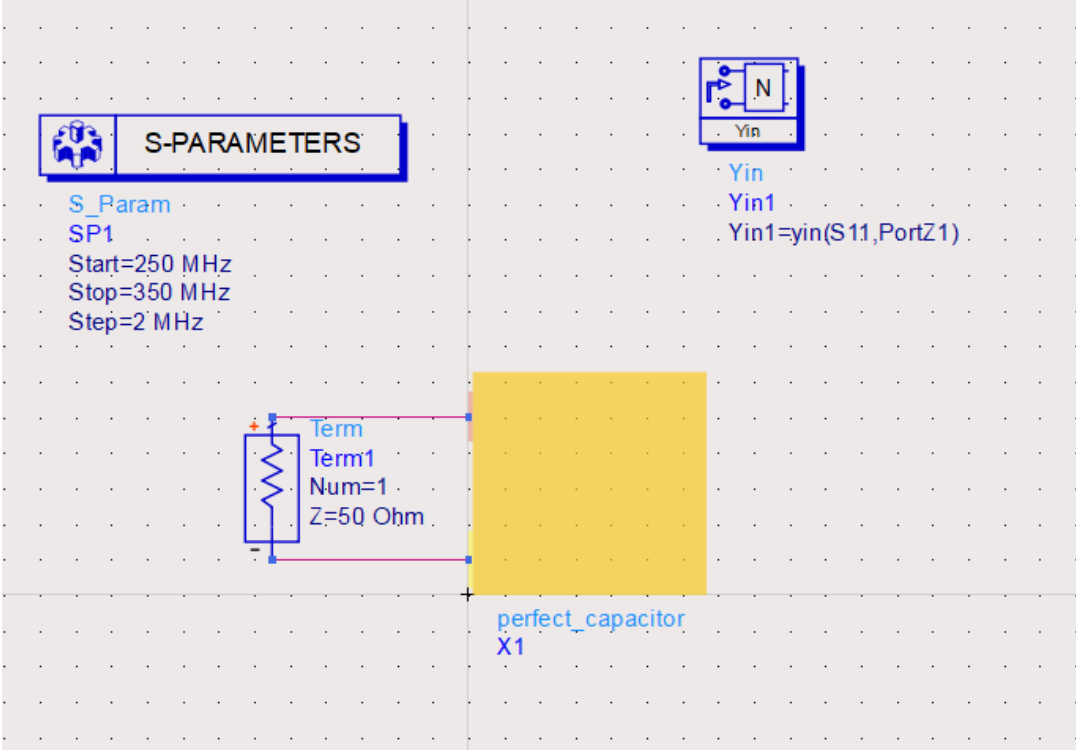


	Type	Name	Material	Thickness
	Dielectric		AIR	
1	Conductor La...	cond (1)	PERFECT_C...	10 um
	Dielectric		Alumina	0.375 mm
2	Conductor La...	cond2 (2)	PERFECT_C...	10 um
	Dielectric		AIR	

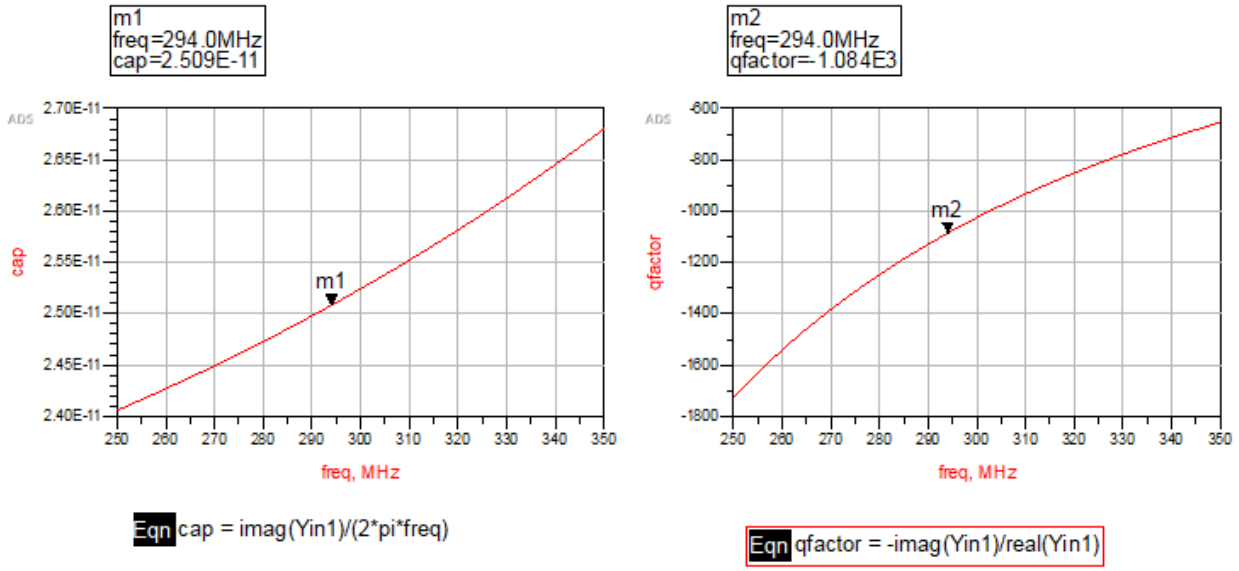
- According to my calculations I designed plates. With 9.8mm sides.



Then I simulated with my design. Then i go on to a schematic view to apply our equations given. I changed S parameters according to my frequency area and my steps. Then i plug in my perfect capacitor.



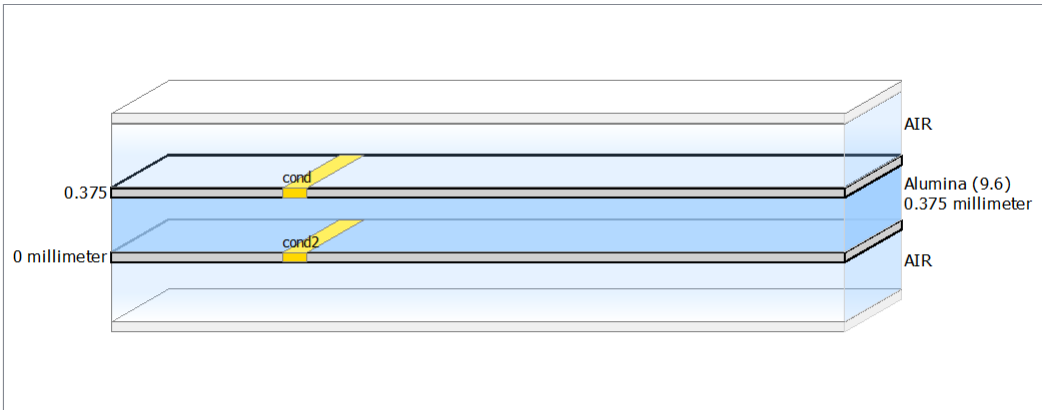
After i input my equations for capacitance and quality factor i gathered those two graphics:



Graphic has shown according to my calculations it should be around 22.2pF and it is 25pF now it is really close to the calculation around 293MHz frequency. And it is a positive value so it acts like a capacitor.

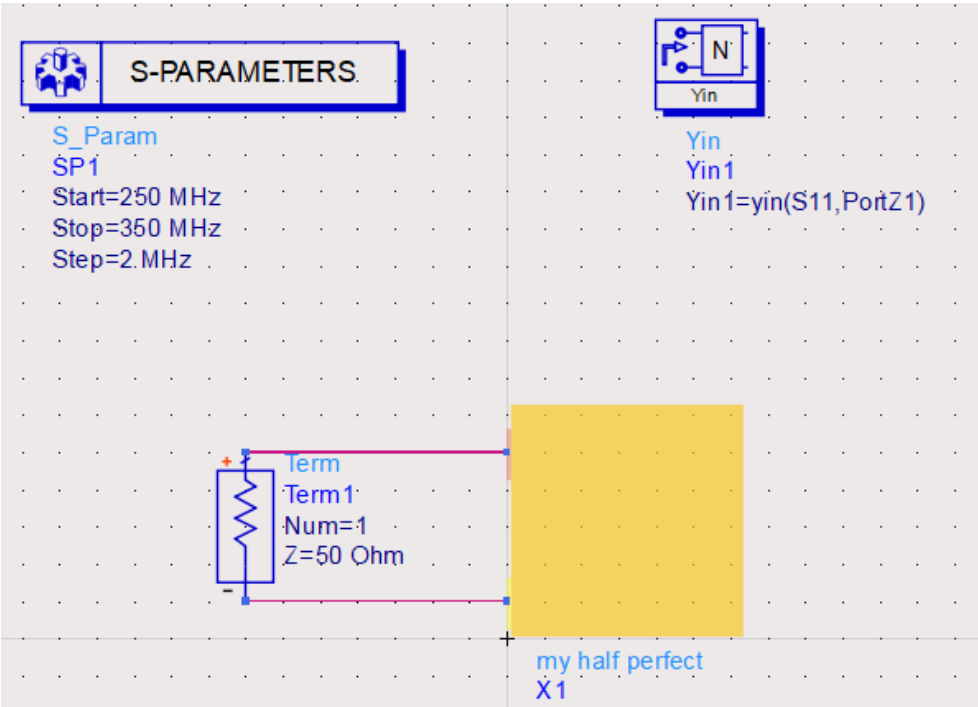
TASK-2(Lossy Conductor-Perfect Insulator):

In this step I changed materials, now conductor layers are **not perfect** they are **Aluminium**.

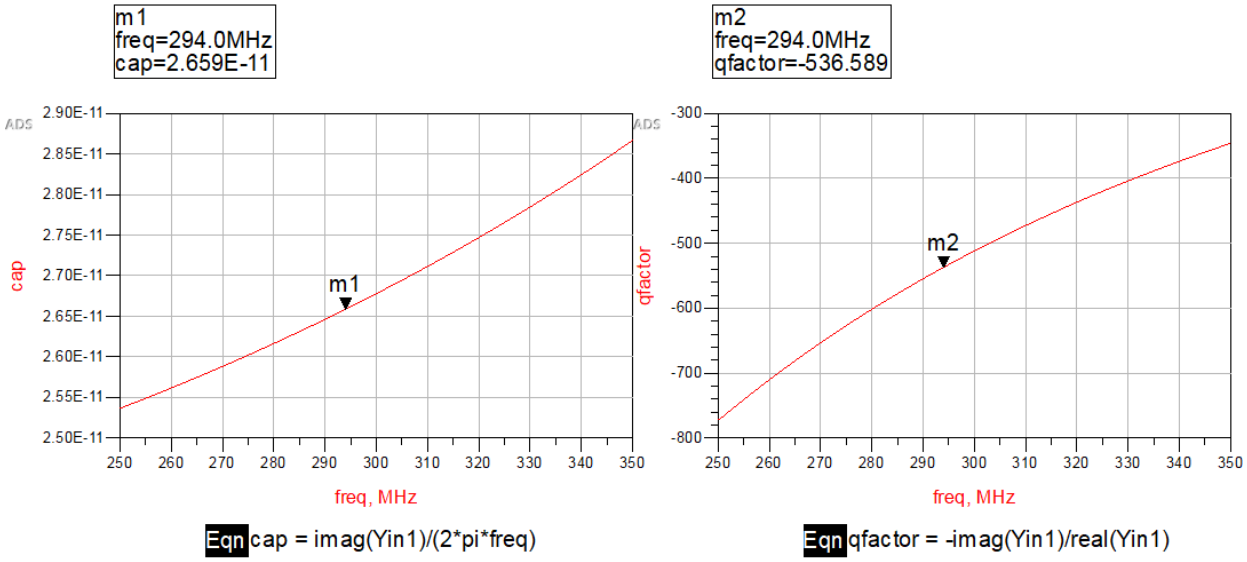


	Type	Name	Material	Thickness
	Dielectric		AIR	
1	Conductor La...	cond (1)	Aluminium	10 um
	Dielectric		Alumina	0.375 mm
2	Conductor La...	cond2 (2)	Aluminium	10 um
	Dielectric		AIR	

For this step I applied the same steps as i did in task-1. Firstly I simulated. And went to the schematic view.



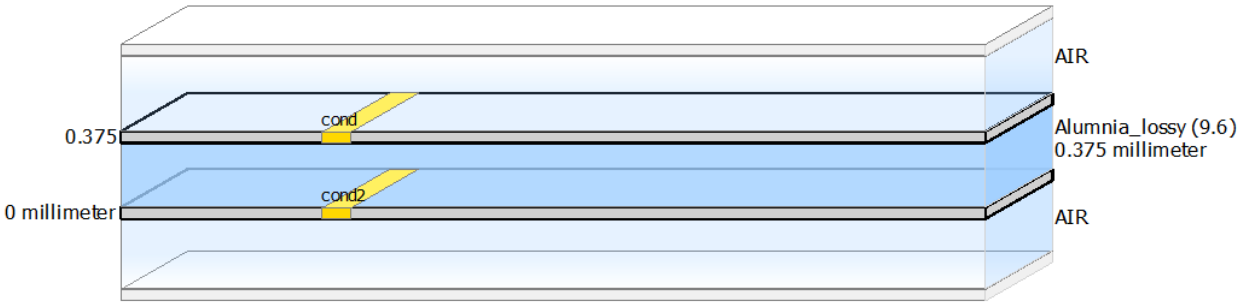
Then again I applied the same equation I did before. And generated graphs accordingly.



Result shows capacitance is really close to 22.2pF but little higher than Task-1.

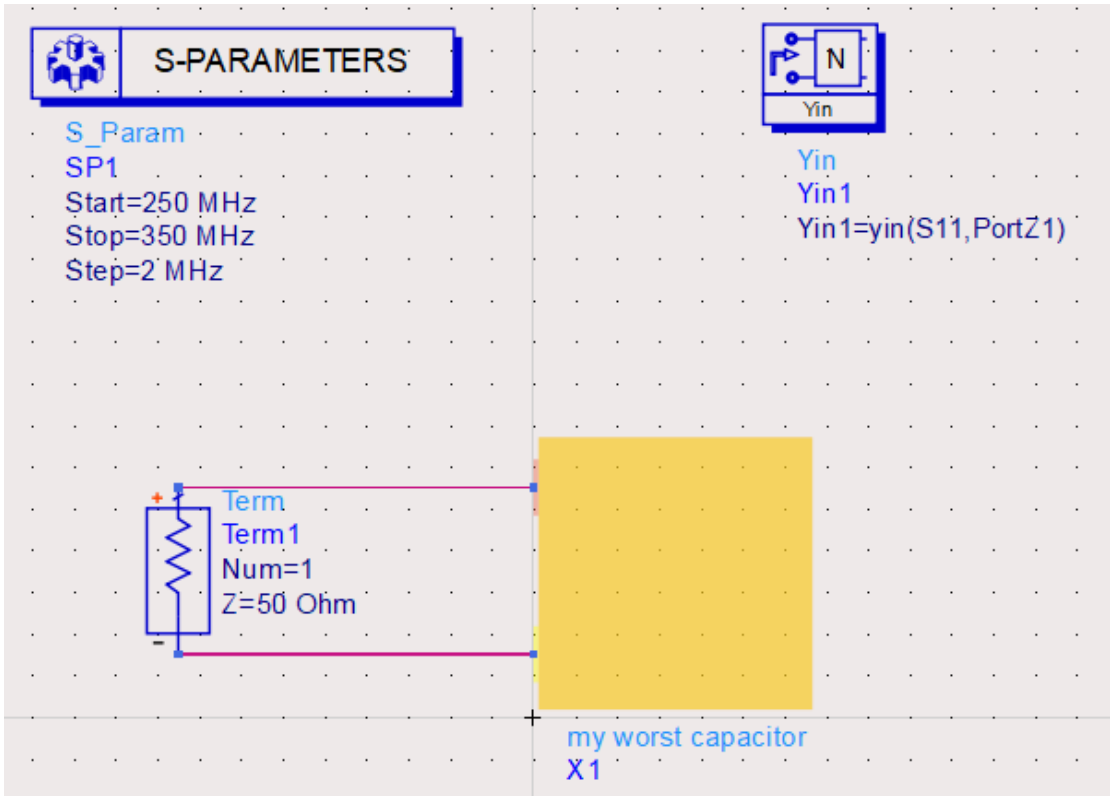
TASK-3(Lossy Conductor – Lossy Insulator):

In this step I also changed the insulator to the **lossy alumina** which has **0.003 tangent loss.**

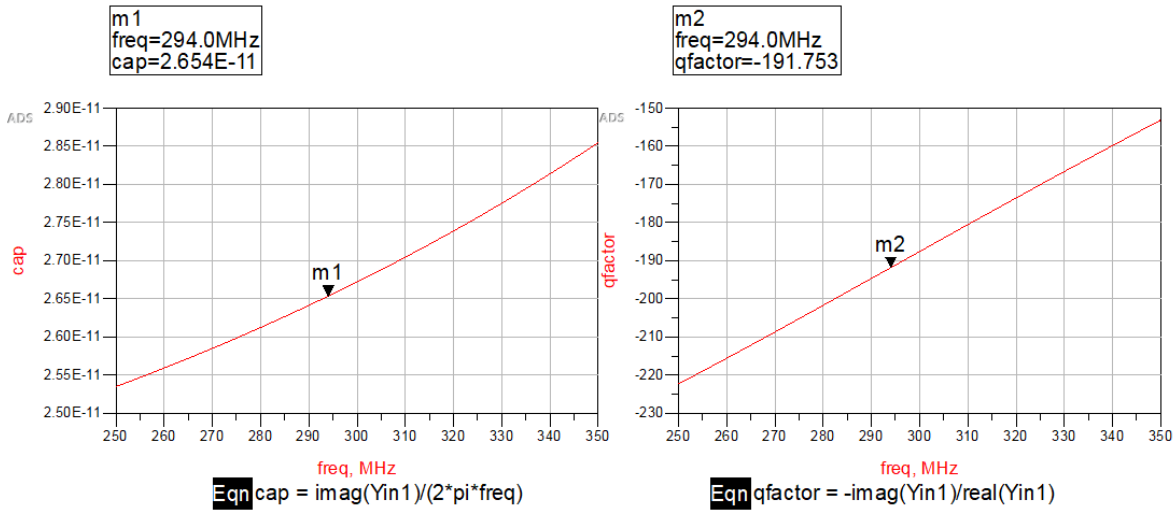


	Type	Name	Material	Thickness
	Dielectric		AIR	
1	Conductor La...	cond (1)	Aluminium	10 um
	Dielectric		Alumnia_lossy	0.375 mm
2	Conductor La...	cond2 (2)	Aluminium	10 um
	Dielectric		AIR	

For schematic view i changed to lossy_conductor and lossy_insulator:



And lastly i applied equations correct way and generated graphs:



It is really close to Task-2 but just a little bit lower capacitance value resulted. As we see Quality factor becomes less negative for each step. And Capacitance Trendlines almost stayed the same.