NEVER GONNA GIVE

ECE 490-ST
Wireless Computing

Lesson 10a :: Matching boards

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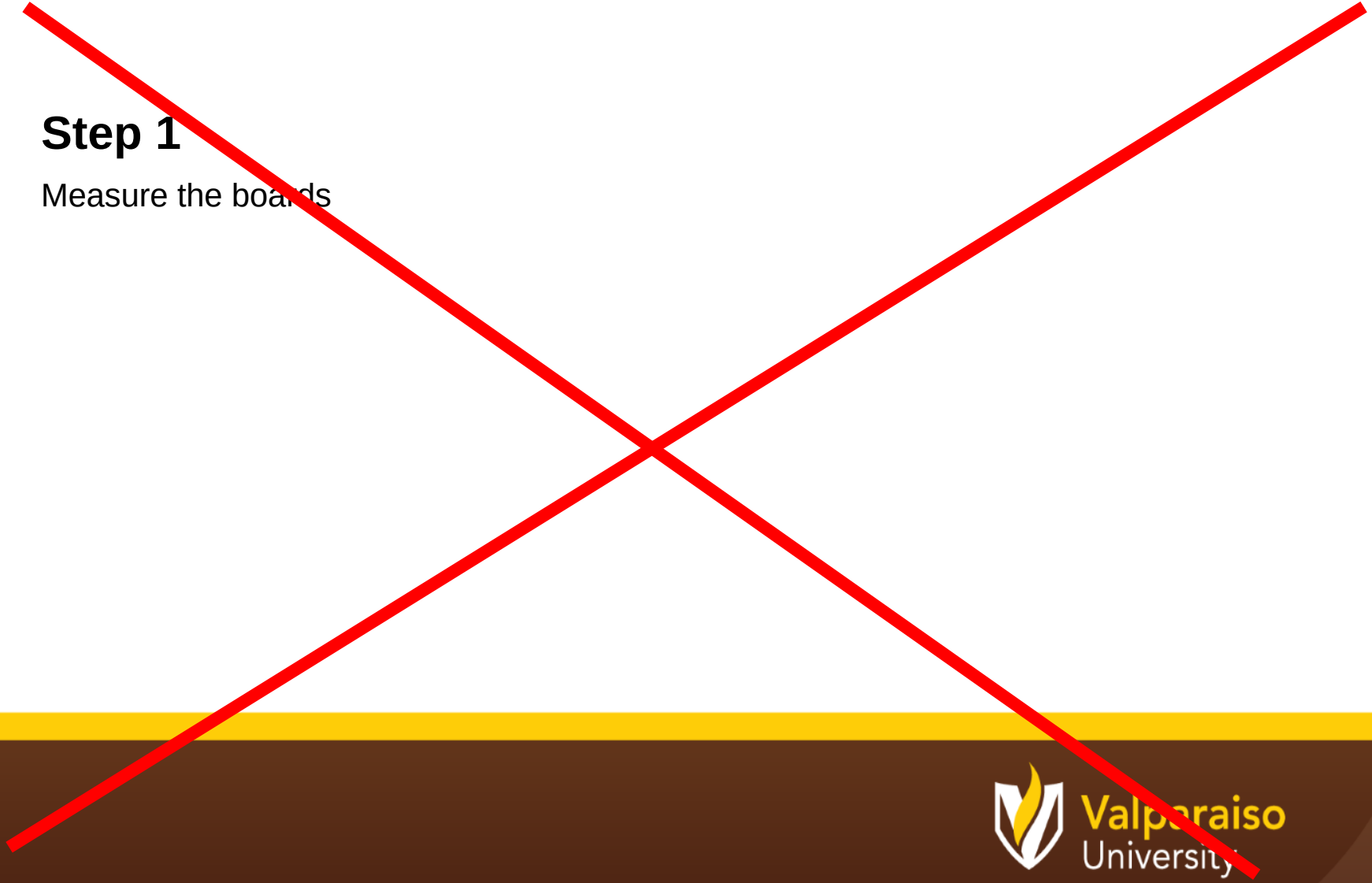
SJT

Step 1

Measure the boards

Step 1

Measure the boards

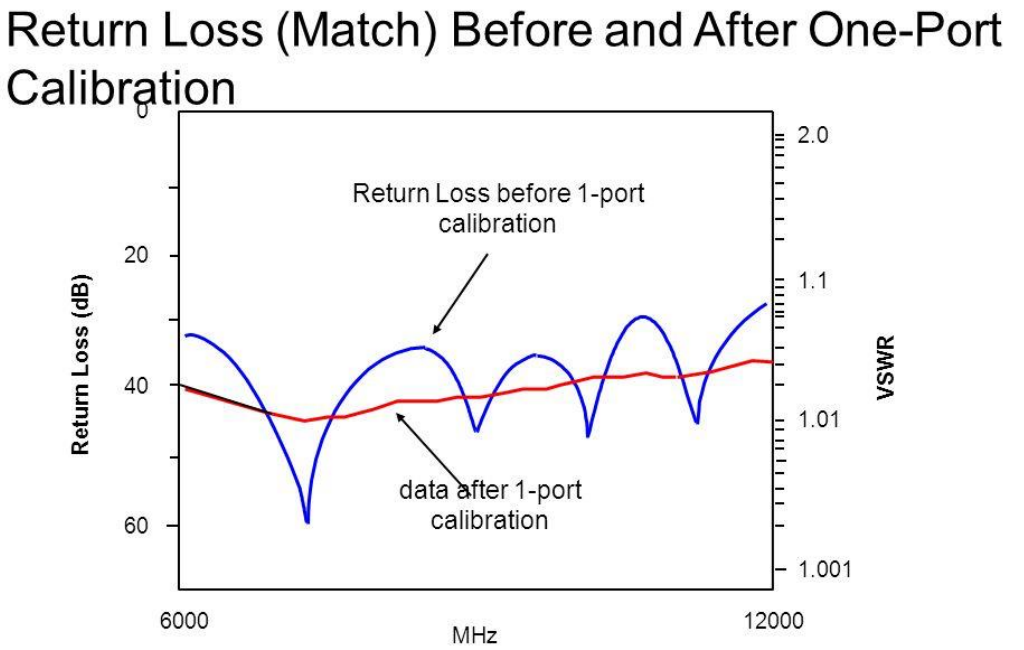


Step 0

Calibrate the VNA

Removes unintended errors

Gives “true” impedance measurement



Step 0

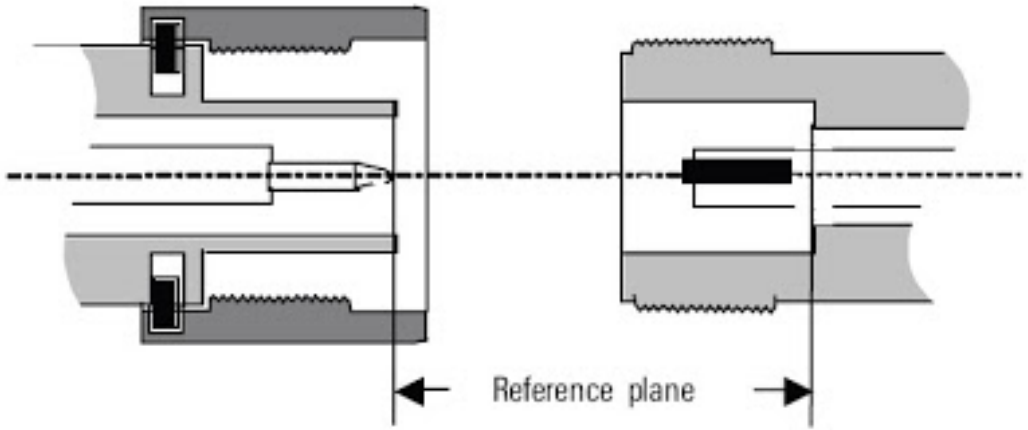
Calibrate the VNA

Removes unintended errors

Gives “true” impedance measurement

Calibrate with 3 known impedances

Typically, Open, Short, Load

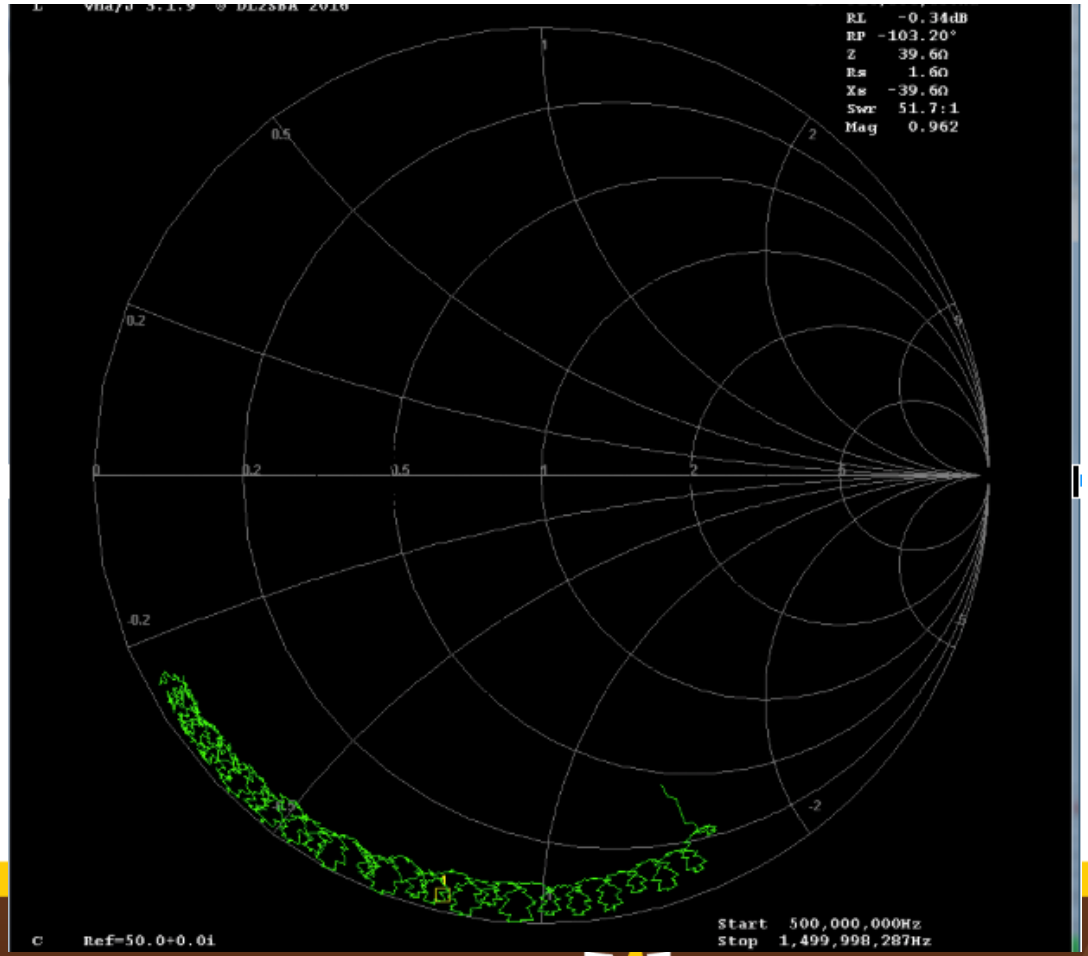


Location of the reference plane in a Type-N connector

Step 1

Measure the boards

$Z_L = 1.6 – j39.6$



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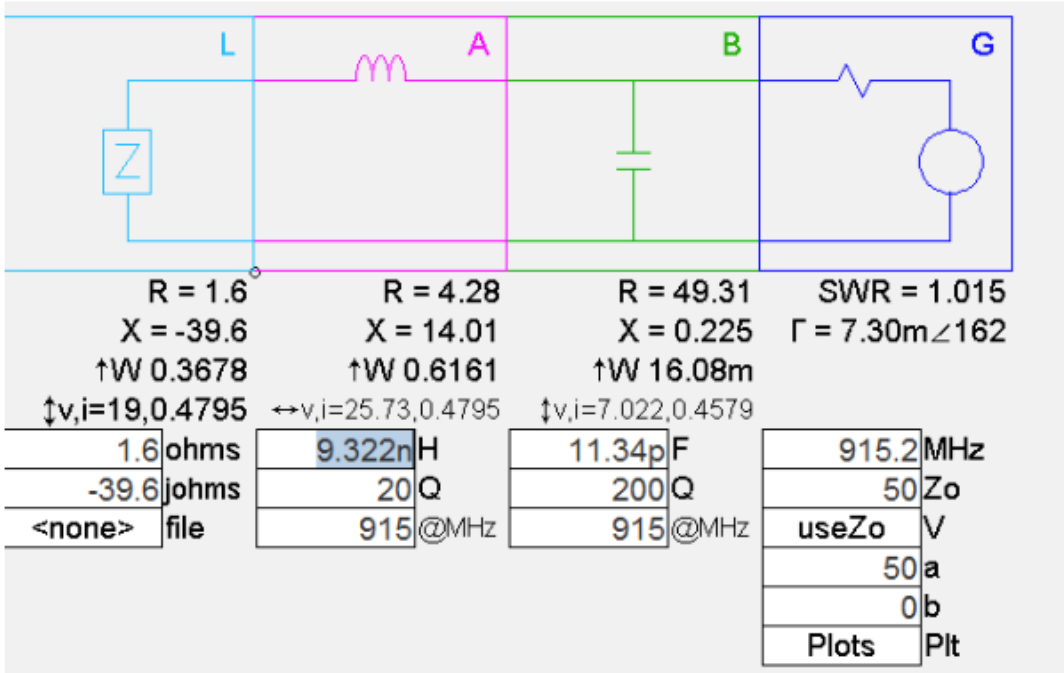
Step 3

Design a matching network

Goal of matching to 50Ω

Series L, Shunt C

Use 10 nH first

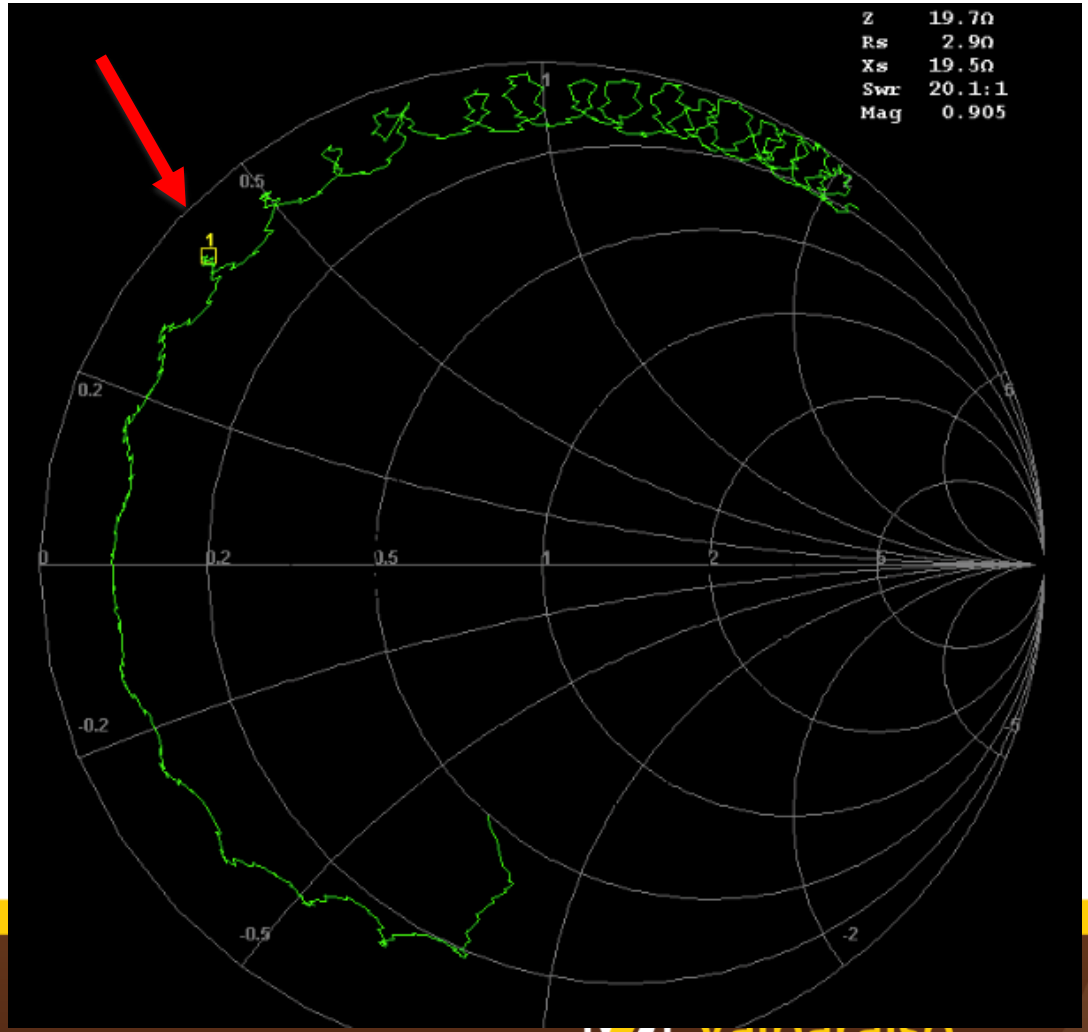


Step 4

Start implementing!

L moves to 2.9 + j19.5
Wanted: 4.2 + j14
L appears as 10.4 nH w/ Q=43

Try 8.2 nH!



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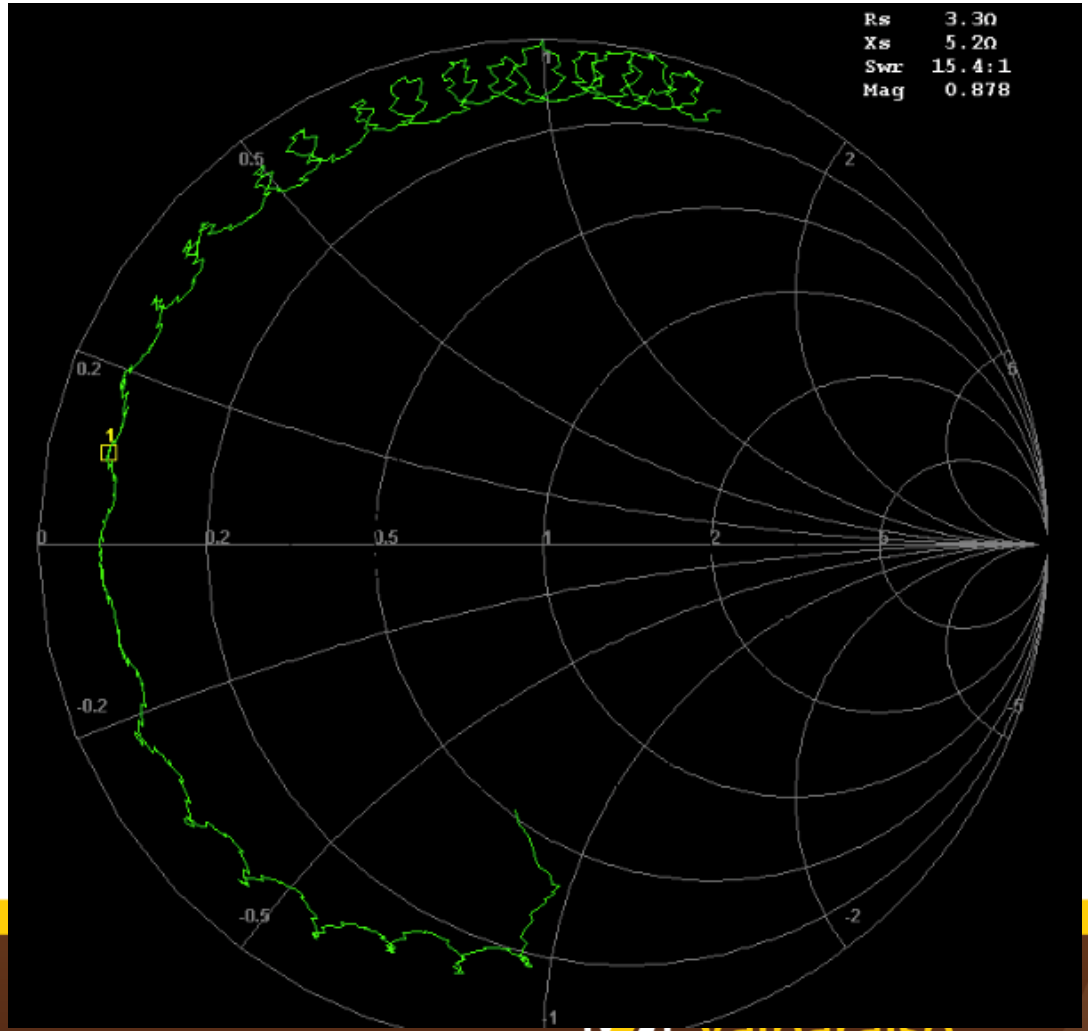
Step 4

Start Implementing!

End up at 3.3 + j5.2 – Too low!

Appears as L of 8.02 nH with Q of 24.4



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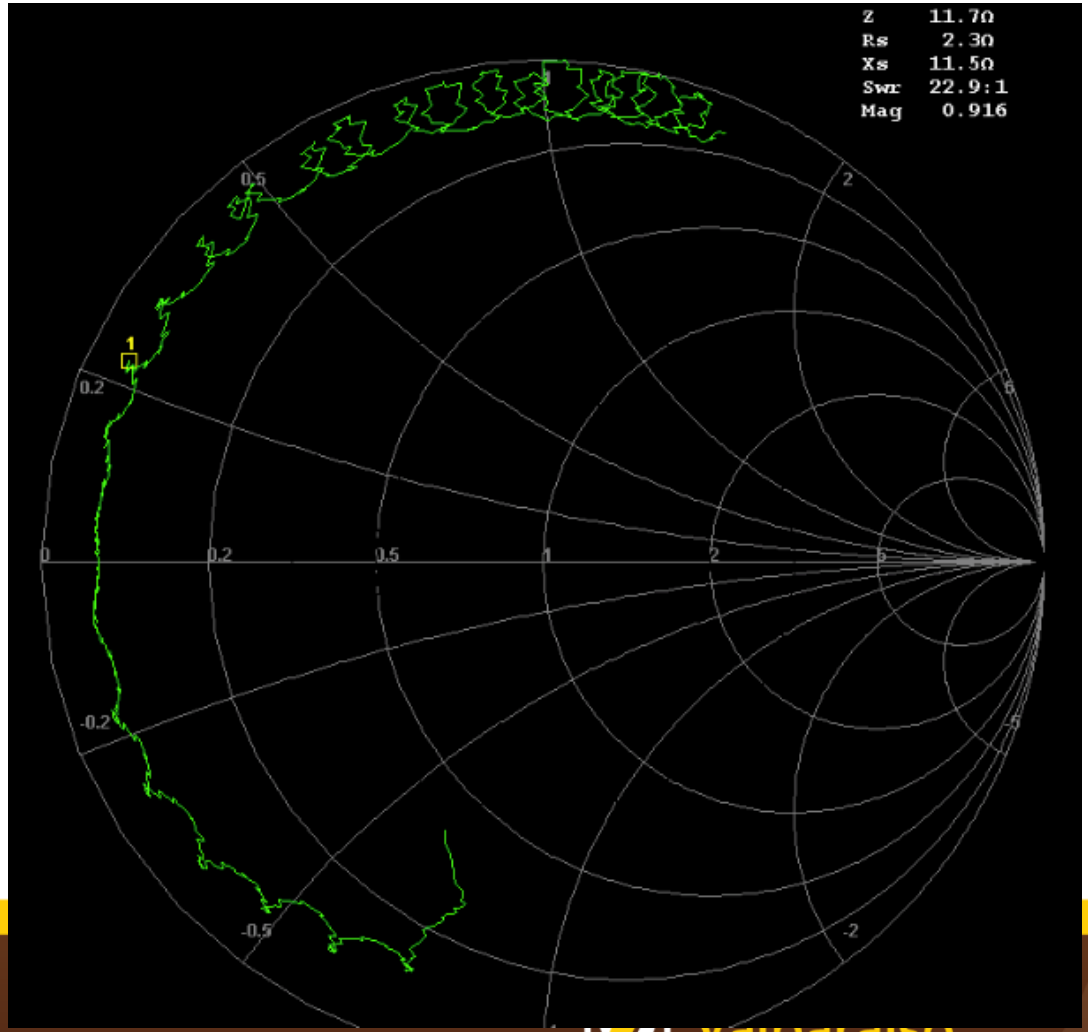
Step 3 (again)

Design a matching network.

Add in a shunt 0.8 pF C next to the load (to counteract parasitics)

Now at, 2.3 + j11.5

Looks good!



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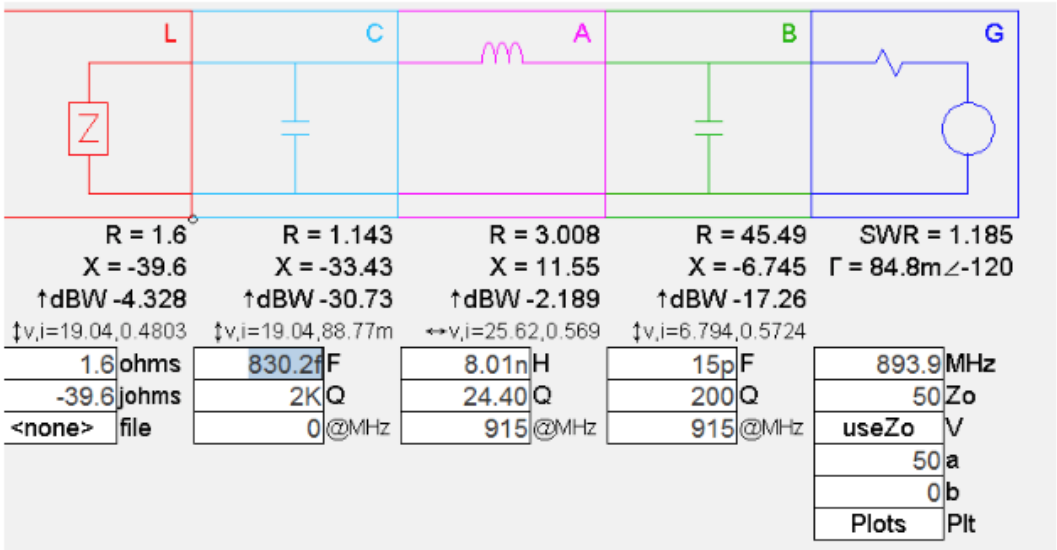
Step 3 (again)

Update your matching network

(includes any “fudge factors” that you’ve found aleady)



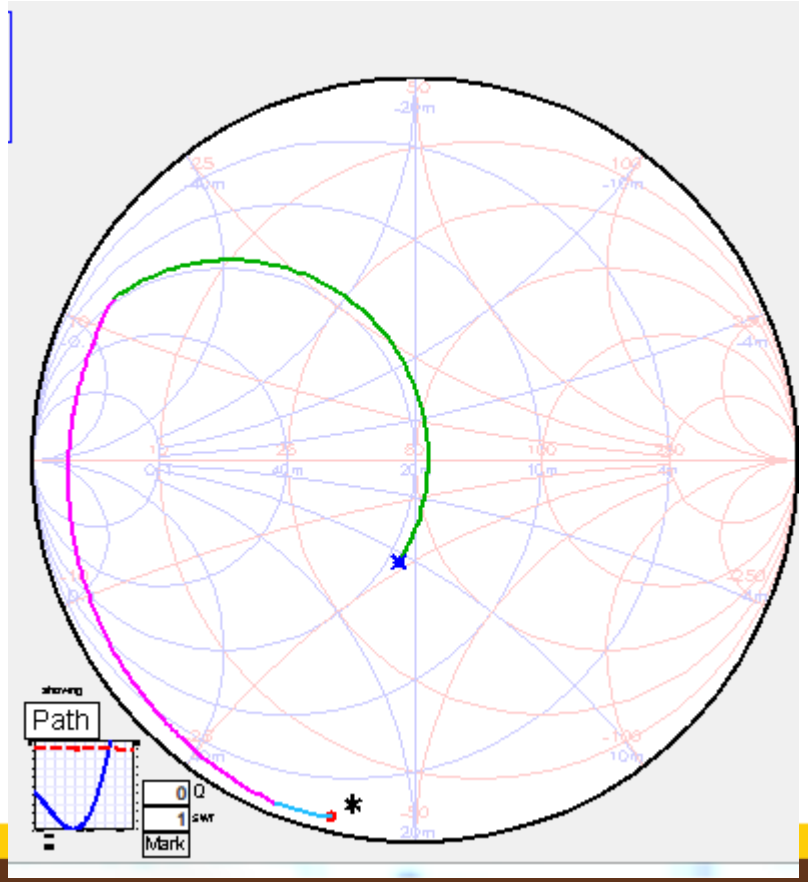
Step 4 Implement it!

Keep implementing changes, reading values from VNA, and moving forward.

(Or rather, backward to the generator)

Add in the last change, and

Goal after final element



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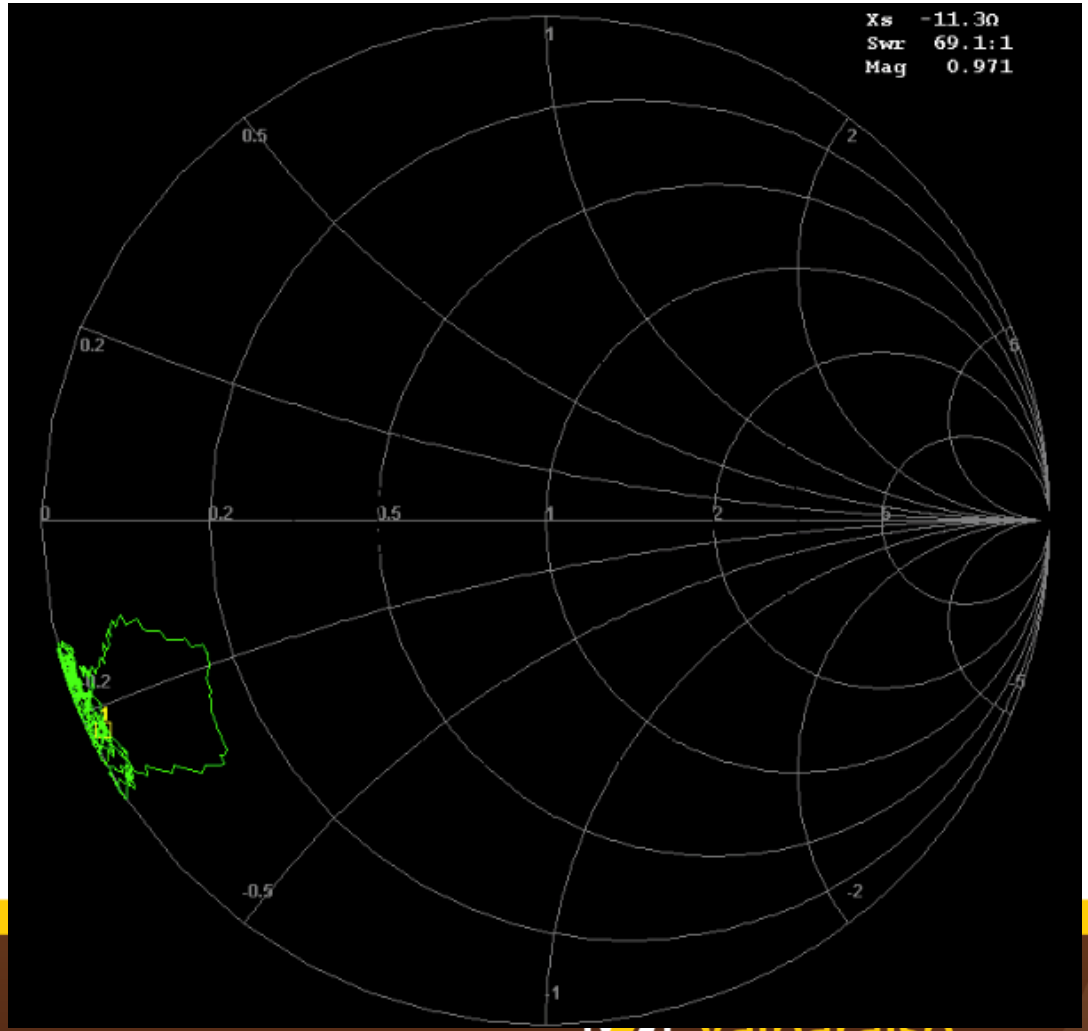
Step 4 Implement it!

Keep implementing changes, reading values from VNA, and moving forward.

(Or rather, backward to the generator)

Add in the last change, and

WAT?



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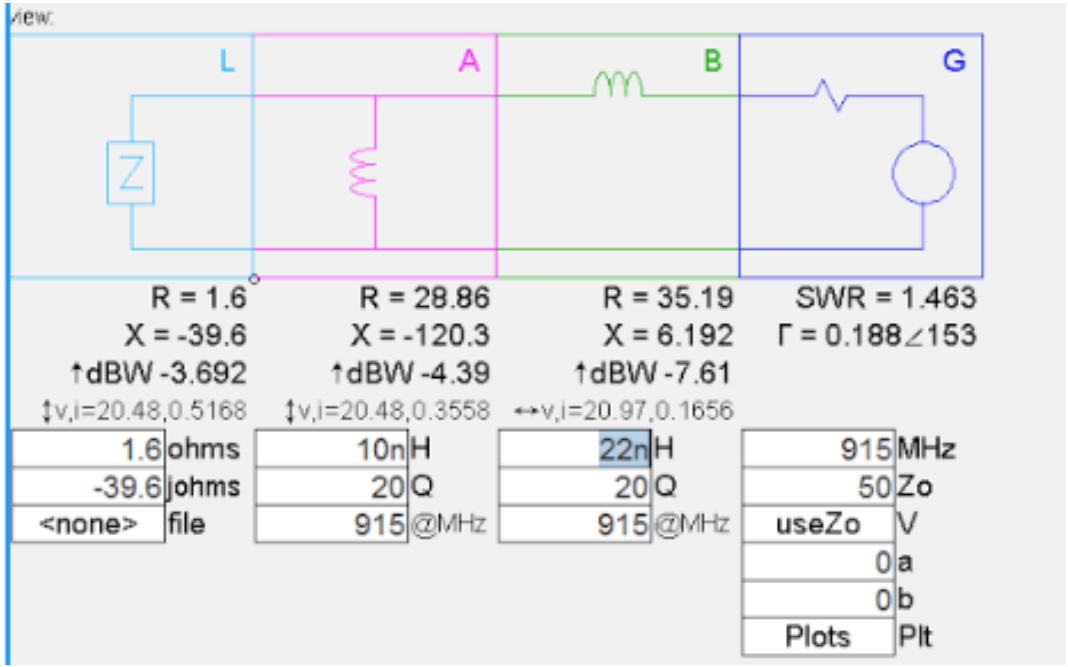
Go back to step 1

Start with a new network.
Forget this old one.

Based on 2 inductors.

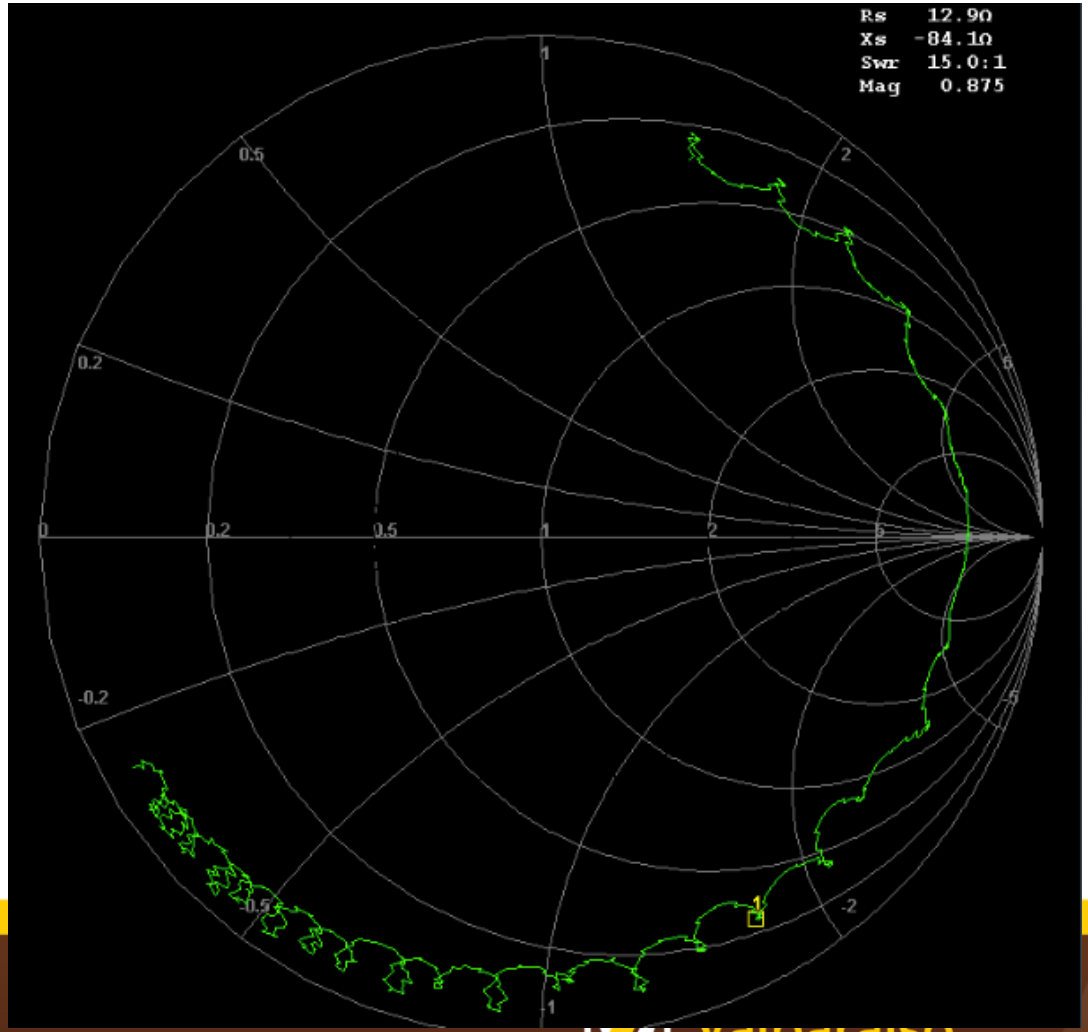
Actually a better design



Step ???

Add in the shunt L, 10 nH

Seems a bit low. Let's reduce the inductance a hair.



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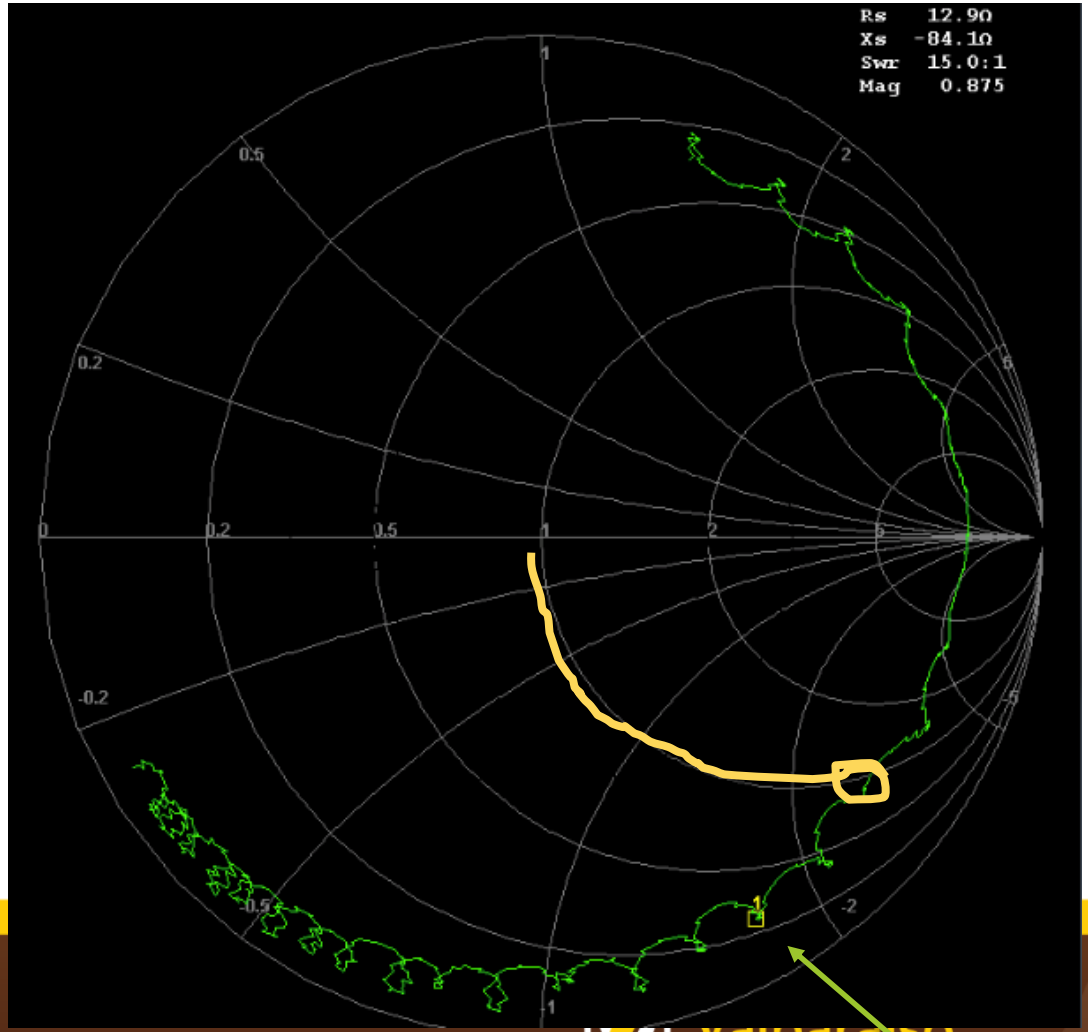
Step ???

Add in the shunt L, 10 nH

Seems a bit low. Let's reduce the inductance a hair.



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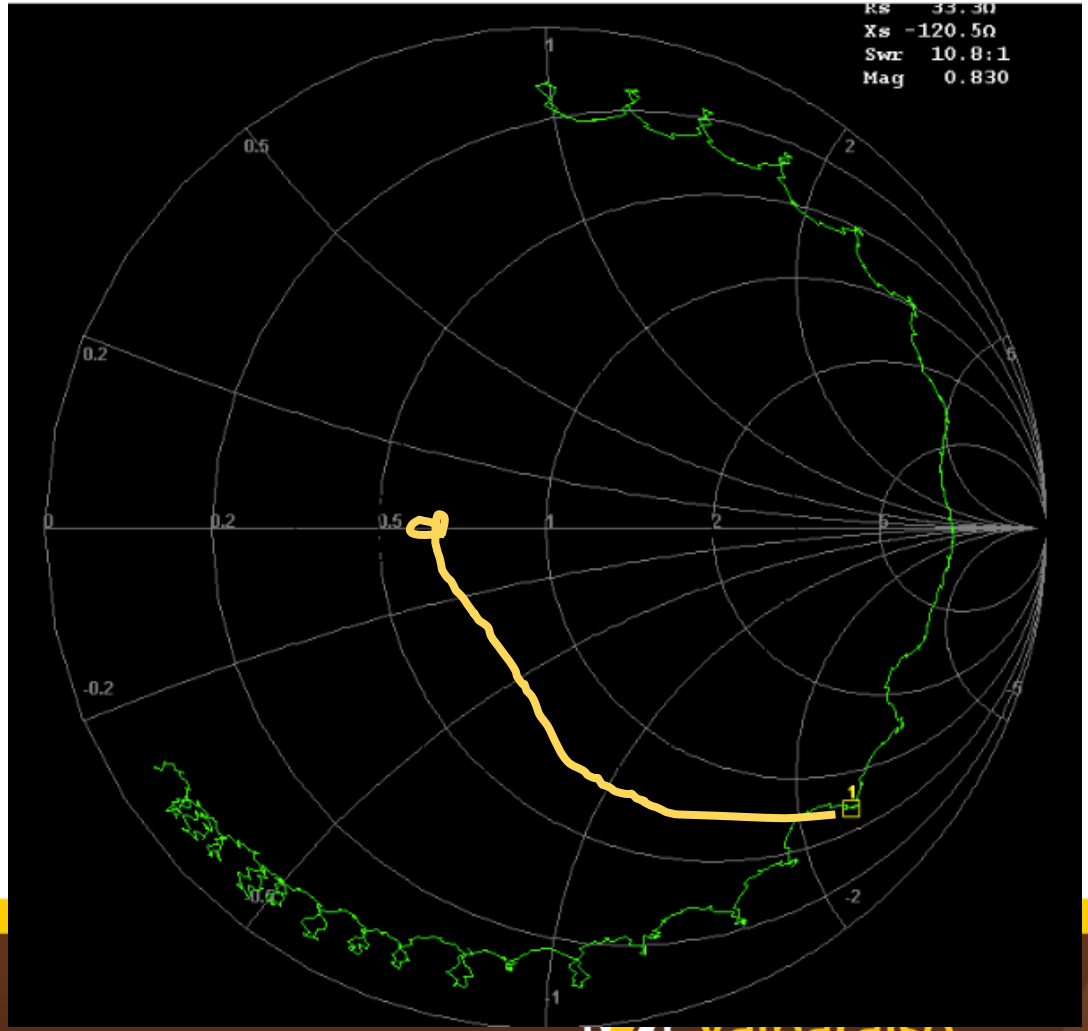
Step ???++

Trying 8.2 nH. Looks good, but seems to add just a bit of capicitance.



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Step Alpeh

Add in the next value …

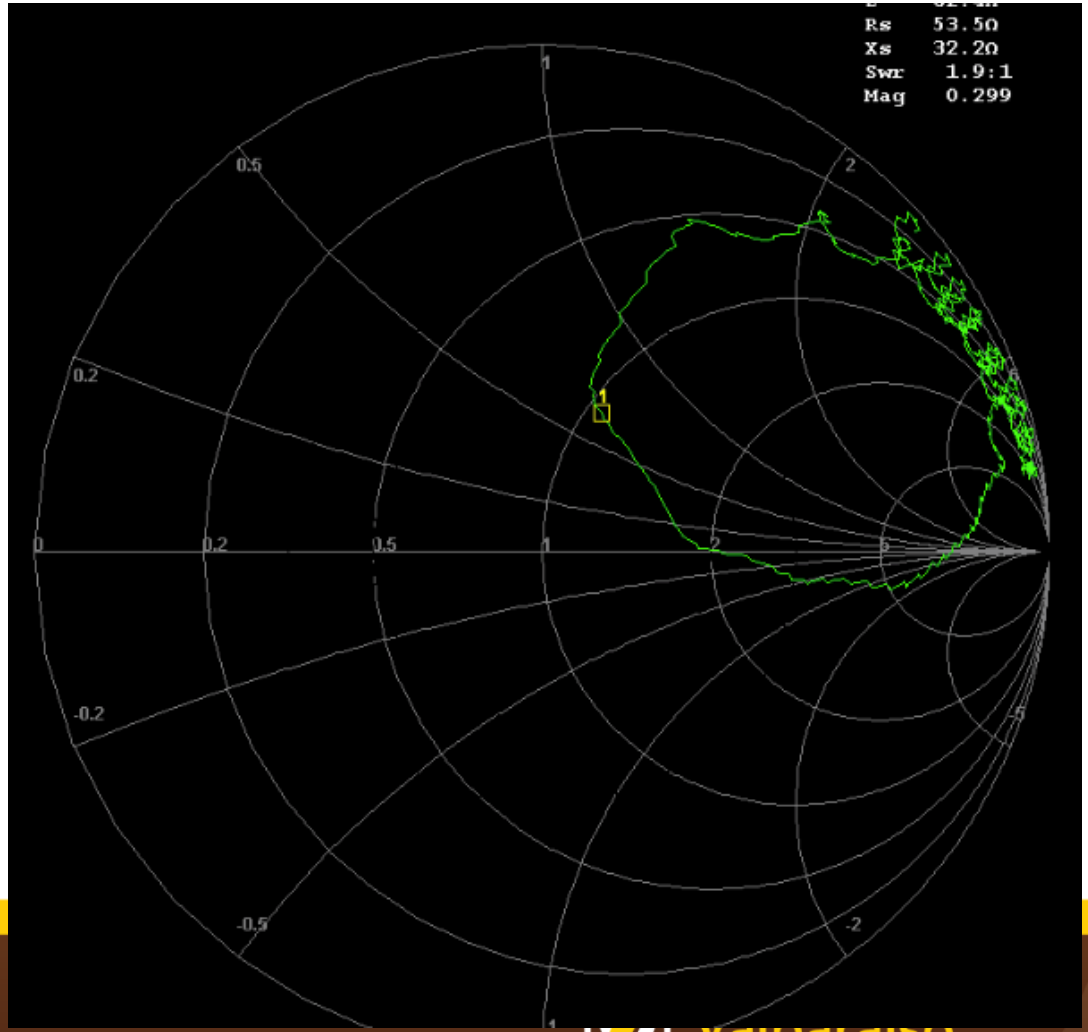
Step Alpeh

Add in the next value …

And claim success!!

The middle of the Smith chart is good.

How good of a match is it?



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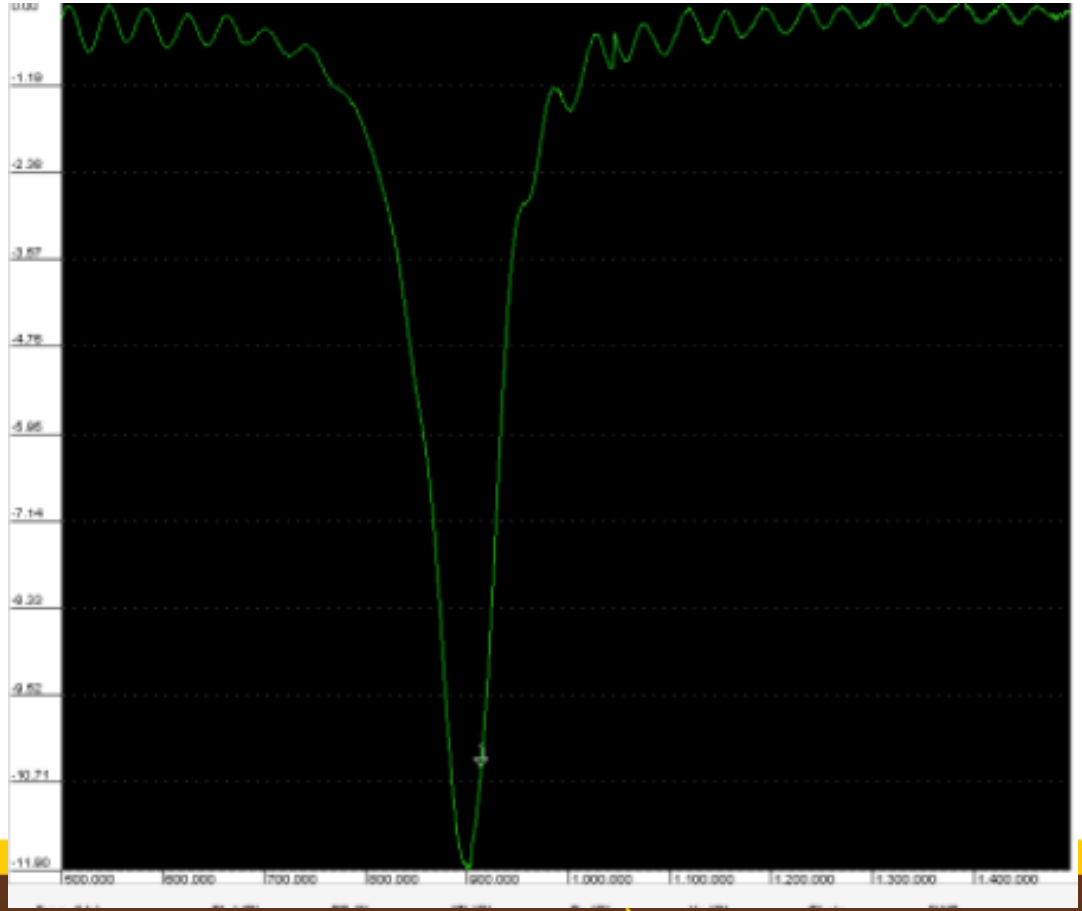
Return Loss

Magnitude of Gamma in deciBels

Low means lower magnitude of Gamma. Meaning less power is being reflected and consequently, more power is being absorbed by the load.



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Step The End

Final component values are:

- A shunt **8.2 nH near the load**. Then a series **22 nH**. Brings the circuit fairly close to 50Ω, our goal.
- Different from your values because … diodes. We will cover this in a future lecture.