MINI PROJECT 1

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Calculations

We need a step-down matching network to match 250 Ω to 50 Ω.

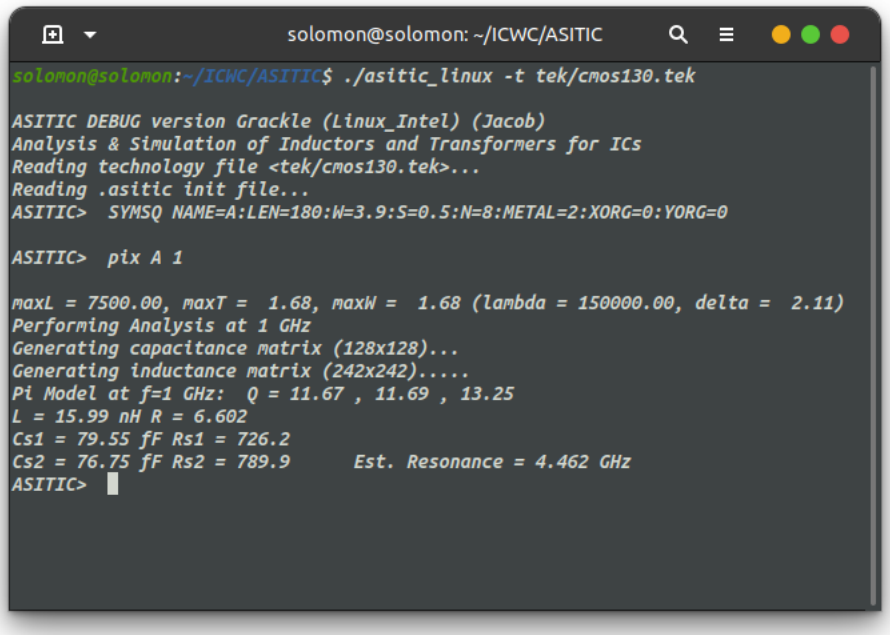
$$Q = \sqrt{\frac{250}{50} - 1} \implies \boxed{Q = 2}$$

$$Q = \frac{\omega L}{50} \implies \boxed{L = 15.9nH}$$

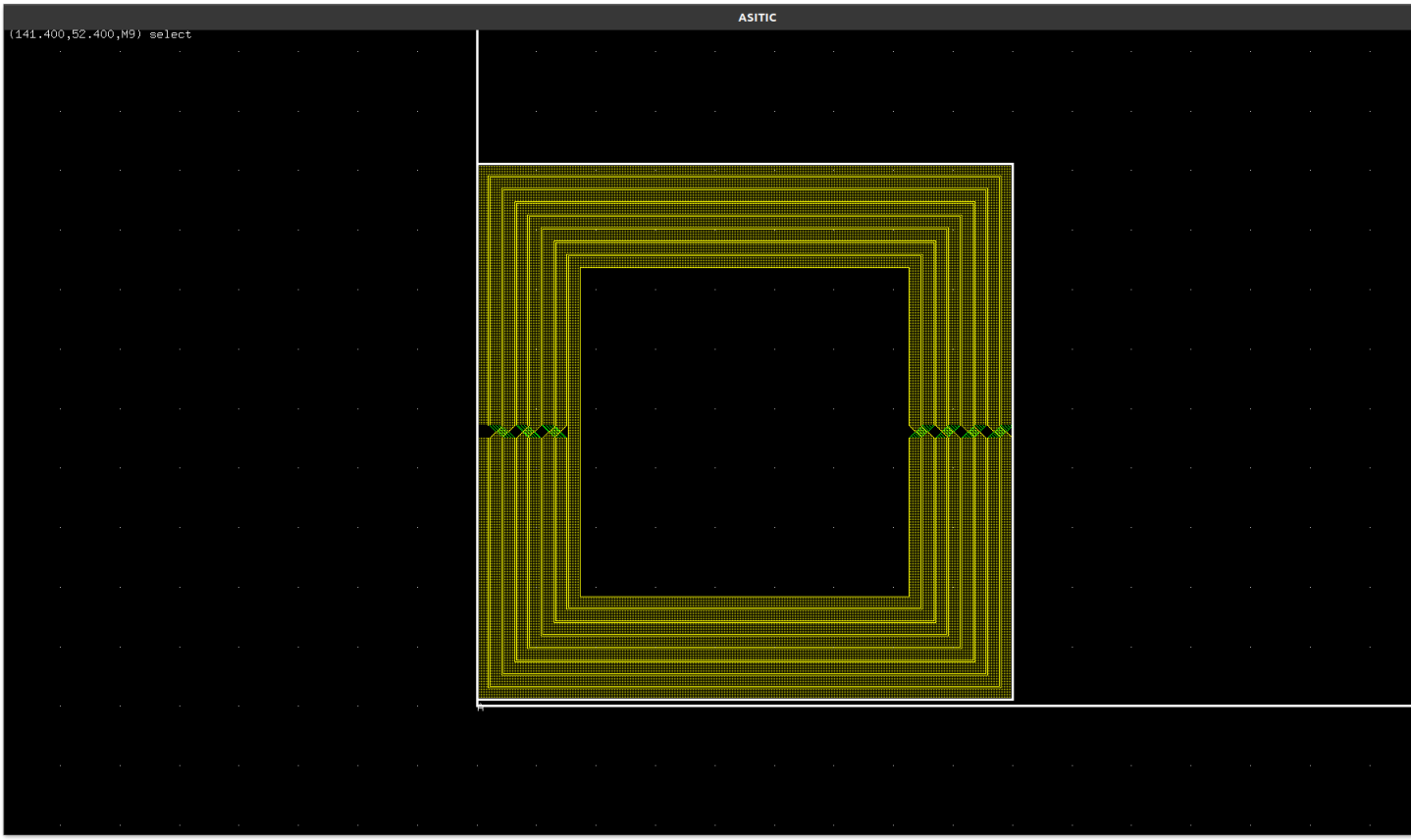
$$Q = \omega C 250 \implies \boxed{C = 1.2pF}$$

On chip inductor design

Inductor design is done on ASITIC CAD tool. Using **Square Symmetric Spiral** with the below specifications.

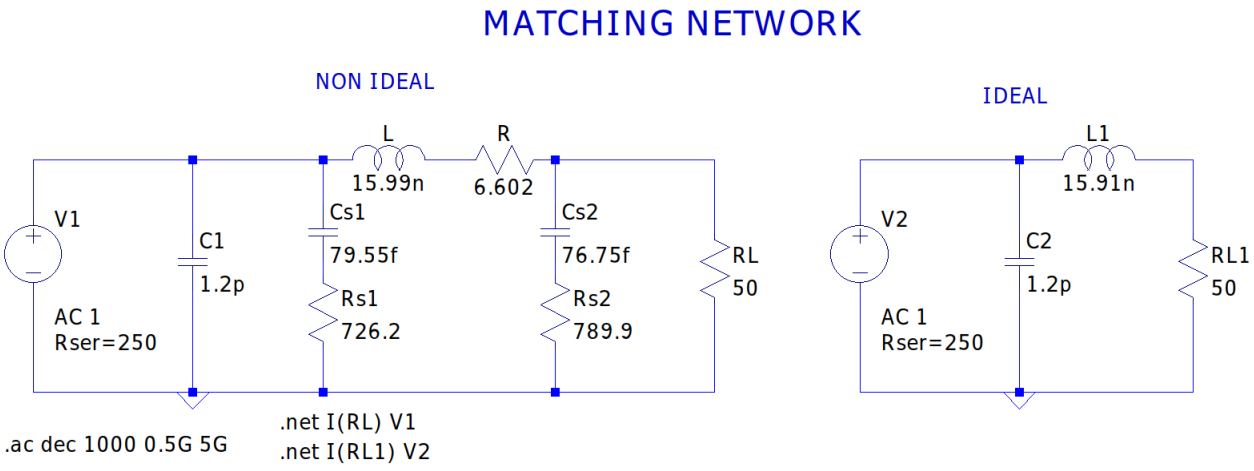


The Pi Model parameters are ,
$\mathbf{L = 15.99nF, R = 6.602\Omega, Cs1 = 79.55fF, Rs1 = 726.2\Omega, Cs2 = 76.75fF, Rs2 = 789.9\Omega.}$



Schematic

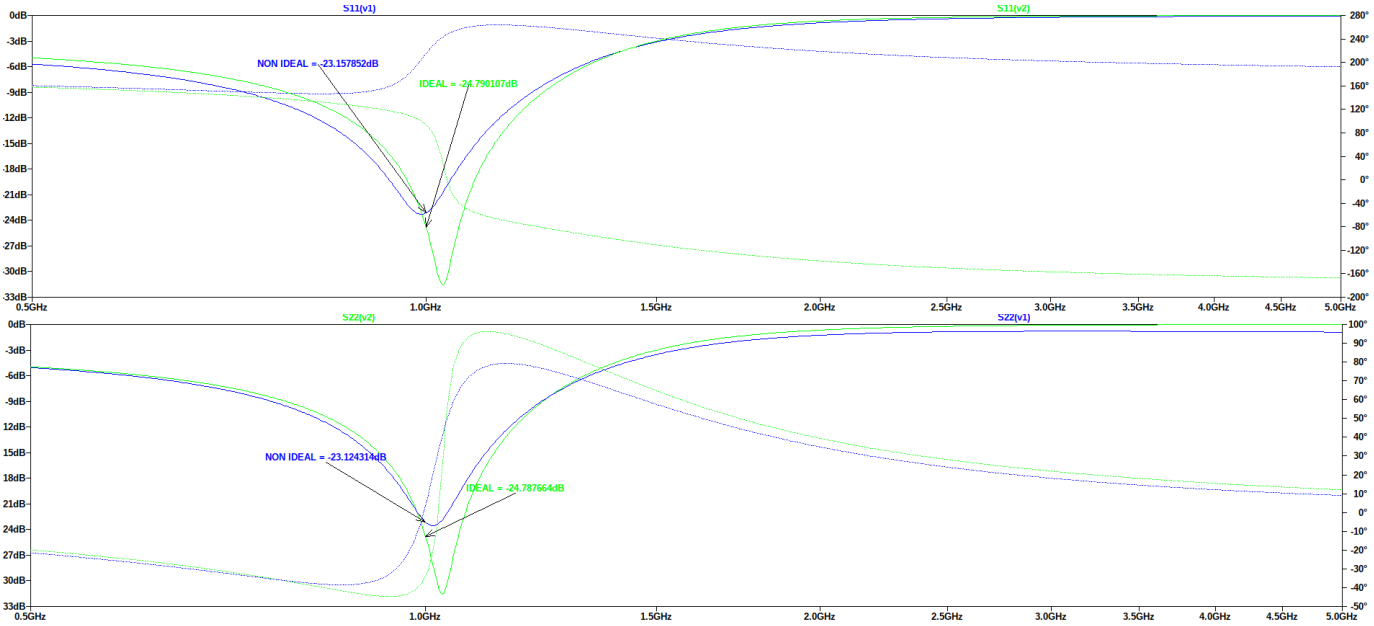
Both ideal and non-ideal networks are simulated and compared.



S-parameters

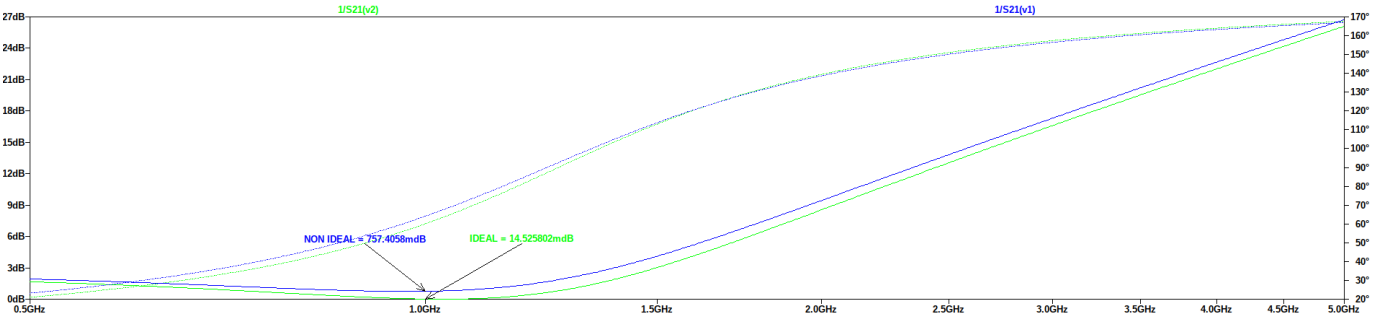
S11, S22 Return Loss

Port 1 side is **-23.15dB** and Port 2 side is **-23.12dB** which also satisfies given constraints.

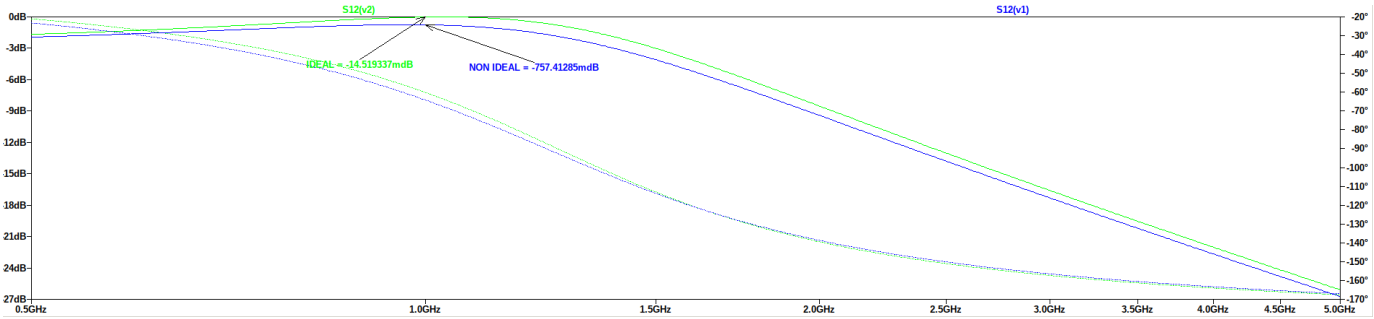


Insertion Loss

Insertion loss here is $-\mathbf{20log}|\mathbf{S_{21}}|$ and the same is plotted. After many iterations of inductor design, insertion loss of **757.4mdB** is obtained.



S12



IDEAL vs NON IDEAL

S-parameters	**IDEAL**	**NON IDEAL**	**Metric**
S11	**-24.79dB**	-23.157dB	*Lower is better.*
S12	-14.52mdB	**-757.4mdB**	*Lower is better.*
S21	**-14.52mdB**	-757.4mdB	*Higher is better.*
S22	**-24.79dB**	-23.12dB	*Lower is better.*