Aim of the Experiment: To design a quarter wave transformer for matching a 50 Ohm microstrip line with a load of **115 Ohms**.

Software to be used: CST studio suite 2019 (Student edition)

Design:

- **Mathematical Calculation**

When l = λ/4 , we have the below equation (equation 1)

$$Z_{in} = Z_o \left[\frac{Z_L + jZ_o \tan(\pi/2)}{Z_o + jZ_L \tan(\pi/2)}\right] = \frac{Z_o^2}{Z_L}$$

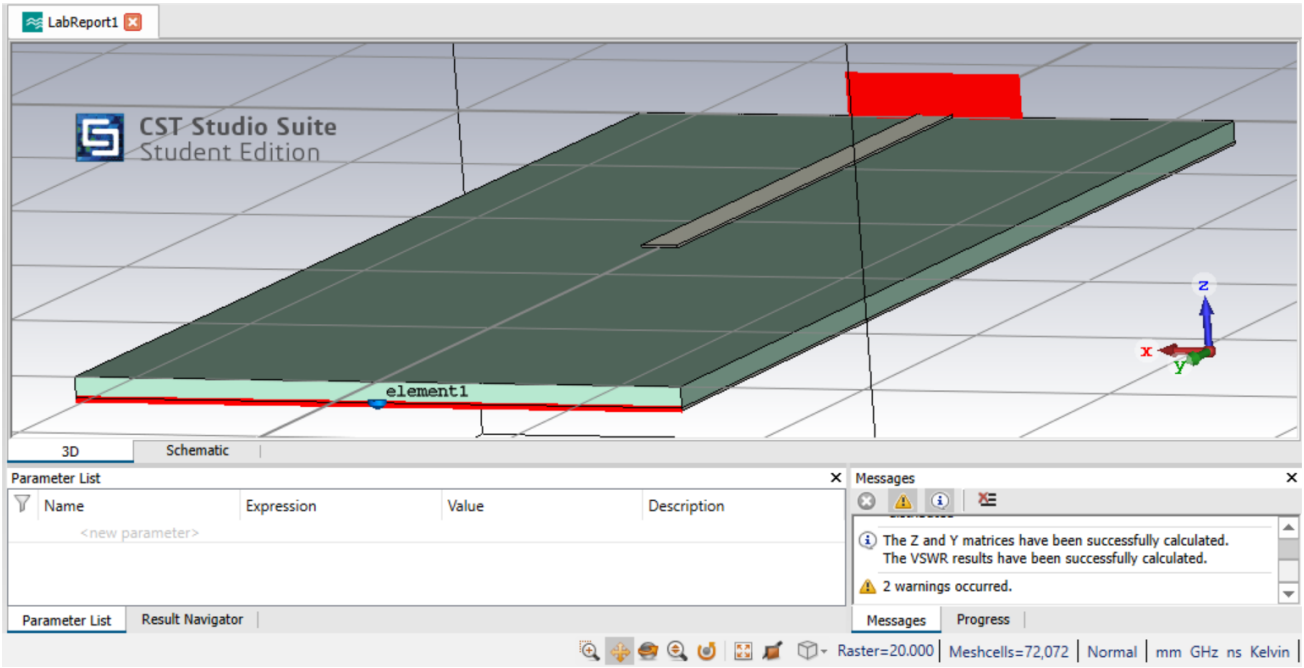
From equation (1), $Z_o^{|}$ is selected such that ($Z_{in} = Z_o$), (equation 2),

$$\therefore Z_o^{|} = \sqrt{Z_o \cdot Z_L} = \sqrt{50 \text{ x } (\mathbf{115})} = 75.828 \text{ Ohms}$$

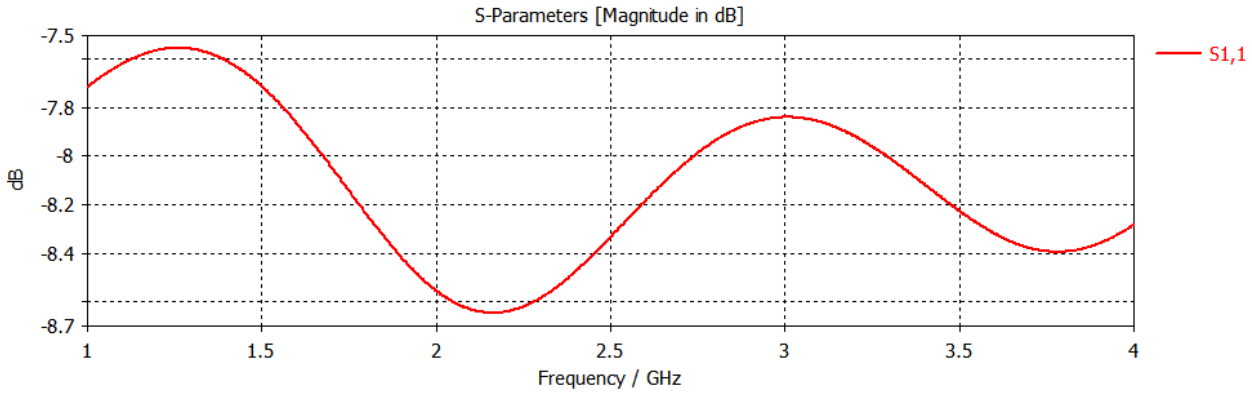
When microstrip line is used, then guided wavelength must be, (equation 3)

$$\lambda_g = \frac{\lambda_o}{\sqrt{\varepsilon_{eff}}}$$

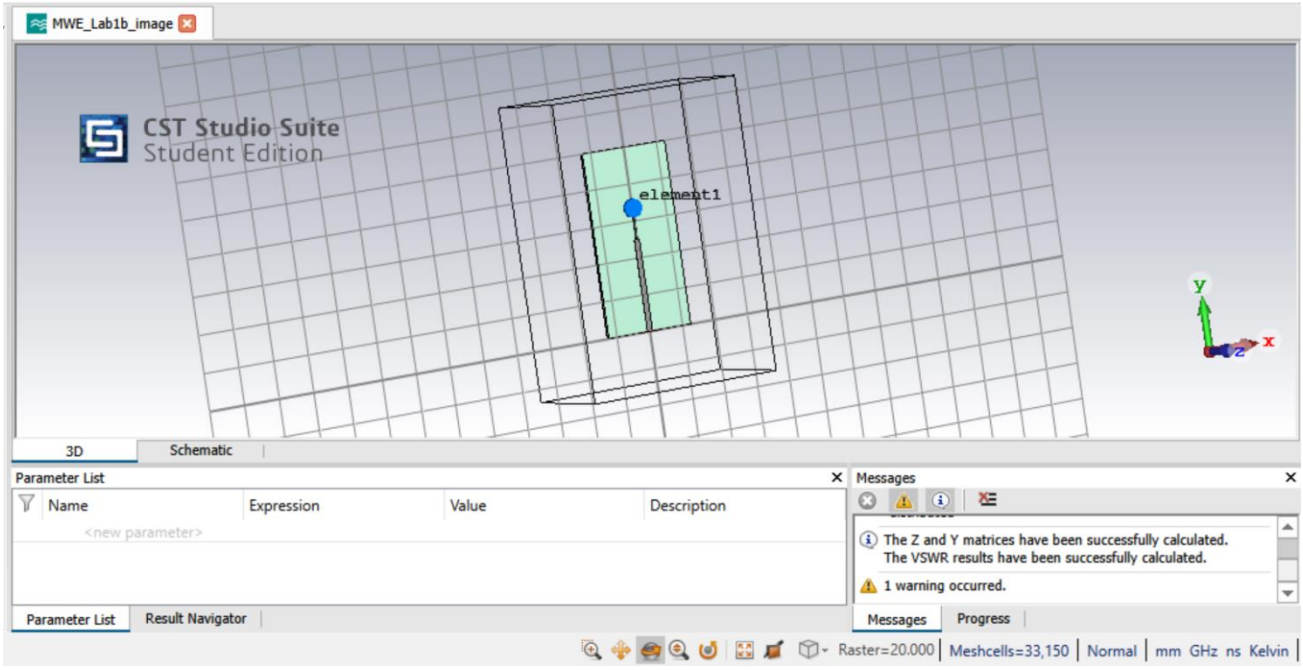
- **Design of microstrip line terminated with the desired load**



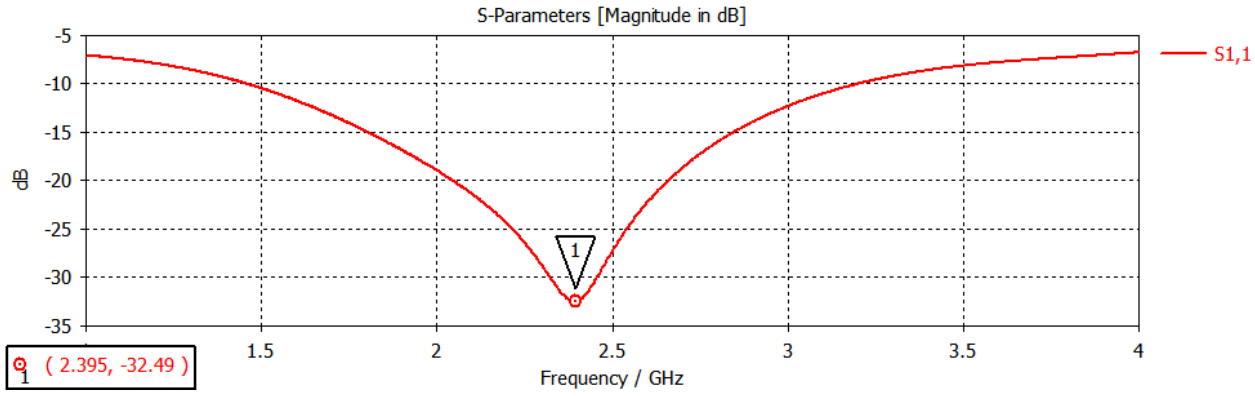
- **S11 characteristics of the microstrip line terminated with the load**



- **Design of microstrip line terminated with quarter wave line and the desired load**



- **S11 characteristics of the microstrip line terminated with quarter wave line and the desired load**



Conclusion

The quarter wave transformer with a load of 115 Ohms was designed for matching a 50 Ohms microstrip line. An impedance match is achieved at 2.39 GHz by using the aforementioned quarter wave transformer.

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