Example

Design an equal-split Wilkinson power divider for a 50 Ω system impedance at frequency f_0, and plot the return loss (S_{11}), insertion loss ($S_{21} = S_{31}$), and isolation ($S_{23} = S_{32}$) versus frequency from $0.5\,f_0$ to $1.5\,f_0$.

Solution

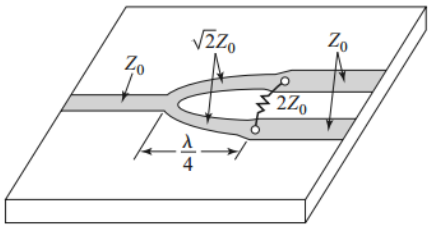
From Figure 7.8 and the above derivation, we have that the quarter-wave transmission lines in the divider should have a characteristic impedance of

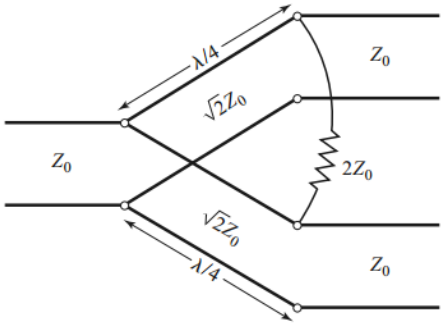
$$Z = \sqrt{2}Z_0 = 70.7\ \Omega,$$

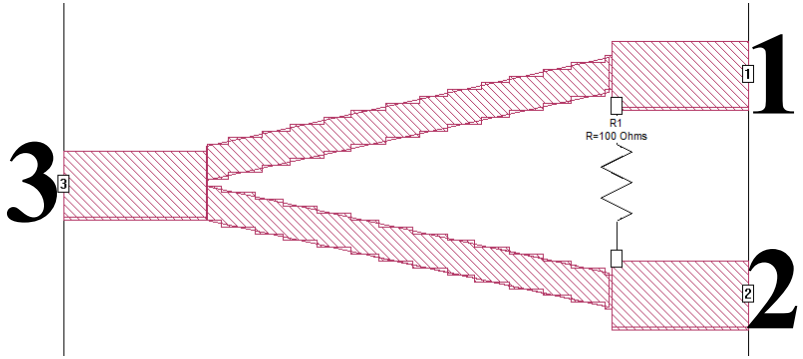
and the shunt resistor a value of

$$R = 2Z_0 = 100\ \Omega.$$

The transmission lines are $\lambda/4$ long at the frequency f_0. Using a computer-aided design tool for the analysis of microwave circuits, the scattering parameter magnitudes were calculated and plotted in Figure 7.12. ■

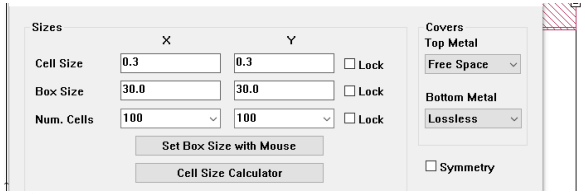


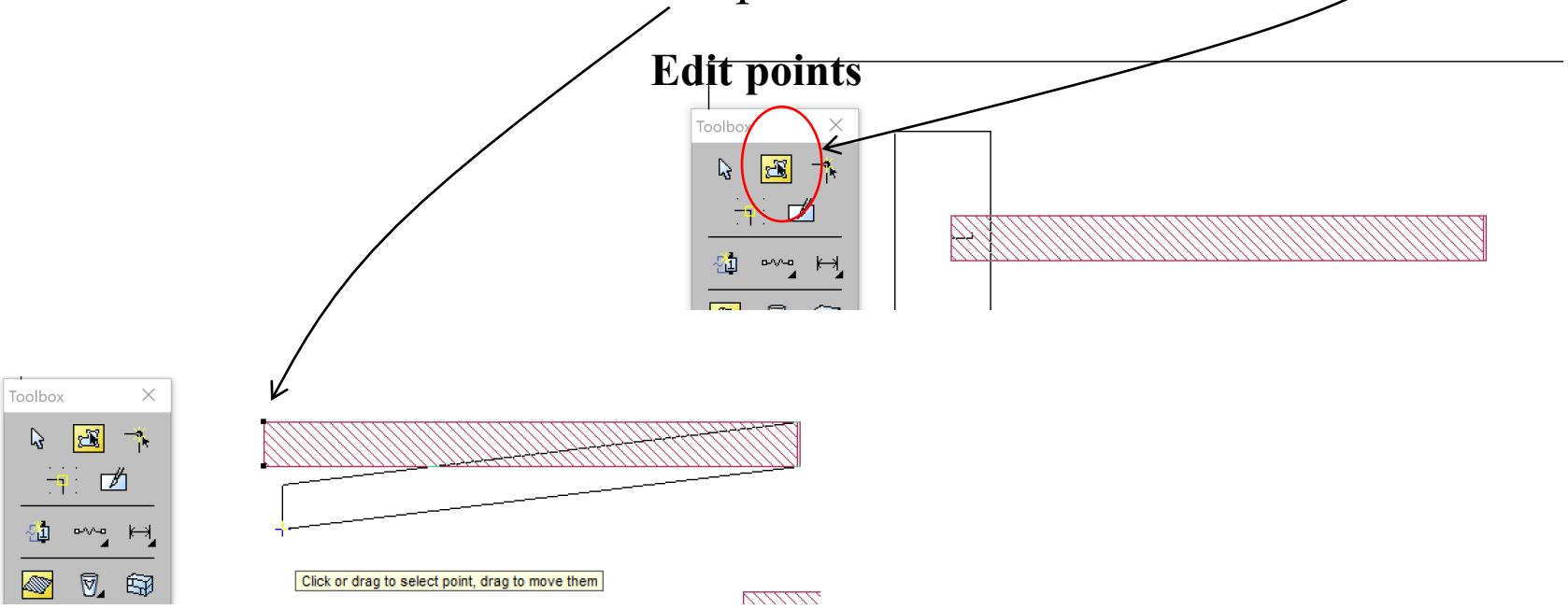




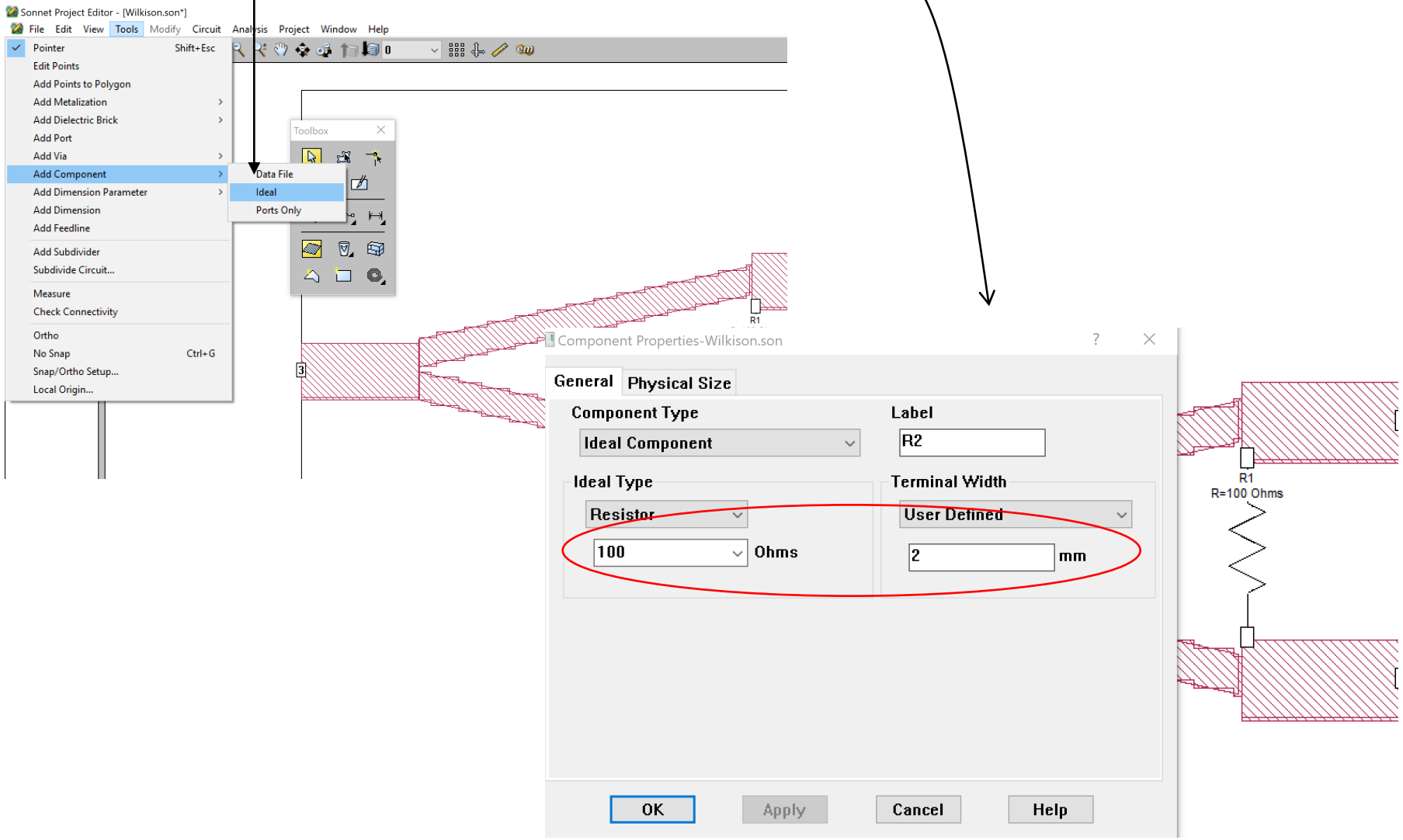
Wilkinson Power Divider Sonnet Assignment

- Using the Wilkinson Power Divider design in the example, obtain a plot for S11, S22 and S33 and plot for S21 and S31 using Sonnet.
  - Cell size = 0.3x0.3
  - Box size = 30 x 30
  - Use FR4 (Er=4.4 d=1.5 mm)
  - Use “Rectangle” function to create the square geometry. “Edit points” feature can be used to move points as shown below.





- The resistor can be found under Tool→Add Component. Resistor properties should be set as shown below



Wilkinson Power Divider (Due April 20th Midnight Online Submission)

- Geometry

❑ **Simulation Results (S11, S22 and S33)**

❑ **Simulation Results (S21 and S31)**

Wilkinson Power Divider (Due April 20th Midnight Online Submission)

Discuss the simulation results

1.
2.
3.