ELC 4384 – RF/Microwave Circuits II

Software Project 2: Distributed Element Matching Circuit Analysis

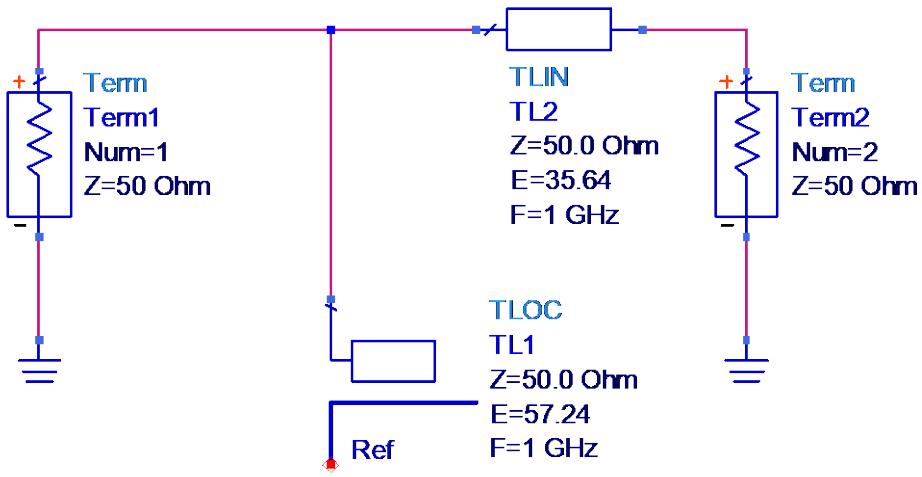
Due Thursday, February 20, 2020

Note: This procedure has been adapted from a procedure written by Dr. Tom Weller at the University of South Florida for the RF/Microwave Circuits II course.

In this software assignment, you will follow Example 2.5.2 from the Gonzalez text. In this example, microstrip matching networks are used to transform 50 Ω terminations into the desired source and load reflection coefficients $\Gamma_s = 0.614\angle 160°$ and $\Gamma_L = 0.682\angle 97°$. You will perform simulations of the input and output matching networks using Agilent Advanced Design System with ideal transmission-line elements.

Part 1: Input Matching Network

1. Create a schematic for the input matching network, as shown in Figure 2.5.14. Note that in ADS, the electrical lengths of the lines must be specified in degrees and the design frequency must be given. Since the frequency is not specified in the problem (all dimensions in the Gonzalez text are in wavelengths), use 1 GHz as the frequency. The circuit schematic in ADS will look similar to the following:



2. Simulate and plot all four S-parameters of the two-port circuit. Plot S11 and S22 on a Smith chart, and S12 and S21 on a polar chart. Sweep the frequency from 0.5 to 1.5 GHz with 401 frequency points.

3. Simulate and plot the source impedance (Zs) and source admittance (Ys), each on separate rectangular plots with the real part on the left y-axis and the imaginary part on the right y-axis. Note that in this step Z(1,1) and Z(2,2) are <u>not</u> the input and output impedances. Use the Zin and Yin equation blocks on the S-parameter palette to perform these calculations from the S-parameter simulation.

4. Place markers on the 1 GHz value of S22 and compare with the desired value of Γ_s.
5. Repeat steps 1 through 4, but replace the open-circuit stub with a short-circuit stub of different length that provides the same value of Γ_s at the design frequency.

Part 2: Output Matching Network

Repeat steps 1 through 4 from Part 1 for the output matching circuit configuration. Be conscious of which port represents the port that would be connected to the device and which port would be connected to the 50-ohm termination in your design. Construct the same plots as in Part 1.

Report

Your report should have a cover sheet with your name on it, the name of the course, and the date of submission. Simulation schematics and data plots should be presented following the order of this procedure with the appropriate steps annotated near the plots and each plot appropriately titled. At the conclusion of the data presentation, answer the following question.

1. In Part 1, what differences did you discover between using the open- and short-circuited stubs?