ELC 4384 – RF/Microwave Circuits II

Software Project 3: Distributed Element Matching Circuits with Microstrip Line Elements

Due Thursday, March 5, 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.

This software project revisits Example 2.5.2 from the Gonzalez text (simulated in Software Project 2), but allows simulation of the transmission lines using microstrip transmission line models in ADS.

Part 1: Input Matching Network

1. Figure 2.5.14 on page 167 displays the microstrip input and output matching networks for the amplifier design. Use Linecalc to determine the dimensions for the stub and series transmission line on a substrate with a thickness of 0.35 mm (14 mils). $\varepsilon_r = 3.8$ and the conductor thickness is 0.035 mm. The dielectric tangent is 0.02. Create the matching network in a sub-circuit schematic that will be referenced from an upper-level schematic.
2. Use the schematic from Software Project 2 (with the open-circuit stub) to create a second sub-circuit that uses ideal transmission –line elements.
3. Create an upper-level schematic that references both sub-circuits to allow comparison of the ideal transmission line performance with the performance of the network using microstrip transmission line elements.
4. Simulate S-parameters at the top level from 0.5 to 1.5 GHz with 401 frequency points. Generate plots of the four S-parameters for each circuit. Keep in mind that the S-parameters for the second sub-circuit will be called S_{33}, S_{34}, S_{43}, and S_{44} by ADS.
5. Simulate and plot the source impedance (Zs) and source admittance (Ys) on separate rectangular plots. Plot Zs for both the microstrip and ideal transmission-line networks on one plot and plot Ys for both networks on another plot.
6. On each of your plots, compare the values of Γ_s obtained in the ideal and microstrip transmission-line simulations with the values specified in the design results.

Part 2: Output Matching Network

Repeat steps 1 through 6 from Part 1, using the output matching circuit configuration. Plot the load impedance and admittance in this case, and compare the values of Γ_L obtained for both the ideal and microstrip transmission-line implementations with the design values.

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. During the presentation, comment on the comparisons between the values of load and source reflection coefficient obtained by using ideal and microstrip transmission line elements.