Laboratory 4, Microstrip Impedance matching and Power Transfer

Objectives:

- *To demonstrate a method of simple T-line impedance matching*
- *To design, build and test a practila1 GHz matching circuit.*
- *To promote an understanding of the usefulness of microwave simulation*
- *To demonstrate how to fit a model to match physical data.*
- *To develop an understanding of how to tune microwave circuits*


Background/Introduction:

   This lab consists of the design, simulation, and construction of a practical Microstrip matching circuit. The will be used to measure the performance of a simple circuit without a matching circuit. The matching circuit will then be incorporated and the performance will be measured again.

The capacitors available for your design are the Johanson Technology S-series, EIA 0402 packages.

Design

- Design a simple match (find d and C) using a 50 ohm transmission line with a shunt capacitor to match a 50 ohm source to a 25 ohm load at 1 GHz.
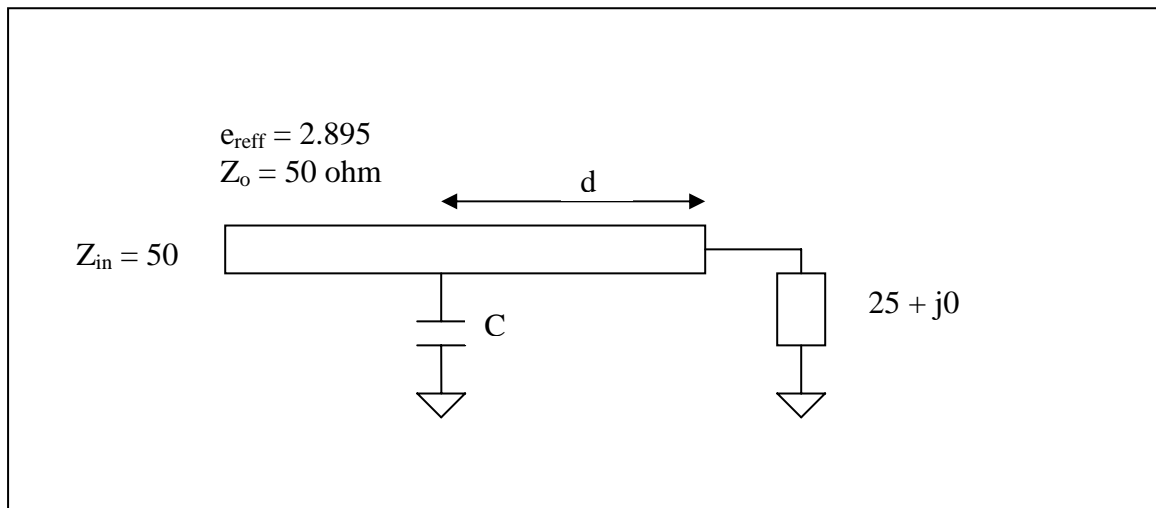
- Derive a model for the Johanson S-seris capacitors per the data sheet on the web site.   Calculate the "actual" part capacitance needed for the match taking the parasitic inductance into account. If you do not need to change the actual capacitor to give the required reactance, explain why?

- Model the circuit using ADS and the real capacitor you have chosen. The input VSWR should be less than 1.2:1 for an acceptable match.

Laboratory Procedures

(1) Calibrate the VNA S11 <u>and</u> S21 for a frequency range of 50 MHz to 10GHz
(2) Measure the test fixture without the match or the 50 ohm resistor attatched.
      a. What is S11 and S21 (insertion loss) of the board at 1 GHz?
      b. Capture the S11 and S21 data for analysis
(3) Attach the two 100 ohm resistors in parallel (50 ohms) at the load end of the test
    board. This with the 50 ohm load of the VNA will provide the 25ohm load.
      a. What is S11 and S21 (insertion loss) of the board at 1 GHz?
      b. Capture the S11 and S21 data for analysis
(4) Attach the capacitor you have chosen at the proper location for the match.
      a. What is S11 and S21 (insertion loss) of the board at 1 GHz?
      b. Capture the S11 and S21 data for analysis
      c. If your match is not at the correct frequency – explain why
(5) Post lab- import the S- parameter data files into the ADS project from Lab 2.
    Adjust your original model to fit the data. Would you use a different value of
    capacitor for your match? This process adjusts

Data Analysis and Reporting
  Write a summary report as you did for the first lab. BE SURE TO INCLUDE
EXPLANATIONS FOR WHAT YOU SEE! See me if you have questions

Capacitor Data:

TEMPERATURE COEFFICIENT:	0 ± 30ppm /°C, -55 to 125°C
QUALITY FACTOR:	2,500 min.,10,000 typical
INSULATION RESISTANCE:	>10 G @ 25°C,WVDC;
	125°C IR is 10% of 25°C rating.
DIELECTRIC STRENGTH:	2.5 X WVDC Min., 25°C, 50 mA max
TEST PARAMETERS:	1MHz ±50kHz, 1.0±0.2 VRMS, 25°C
AVAILABLE CAPACITANCE:	Size 0402: 0.2 - 33 pF
	Size 0603: 0.2 - 100 pF
	Size 0805: 0.3 - 220 pF

Typical Series Resonant Frequency