

ECE 145A/218A, Lab Project #2: Impedance-Matching Exercise.

September 28, 2025.

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Overview

The goal of this exercise is to familiarize yourself with impedance-matching.

This should be a short and easy lab project.

The assignment

Start by constructing a microstrip line, as is shown in Figure 1. This is similar to that you had constructed for lab 1a, and you may well be able to use the same board and line. Make sure that you have a 50 Ohm, or very nearly 50 Ohm line. d

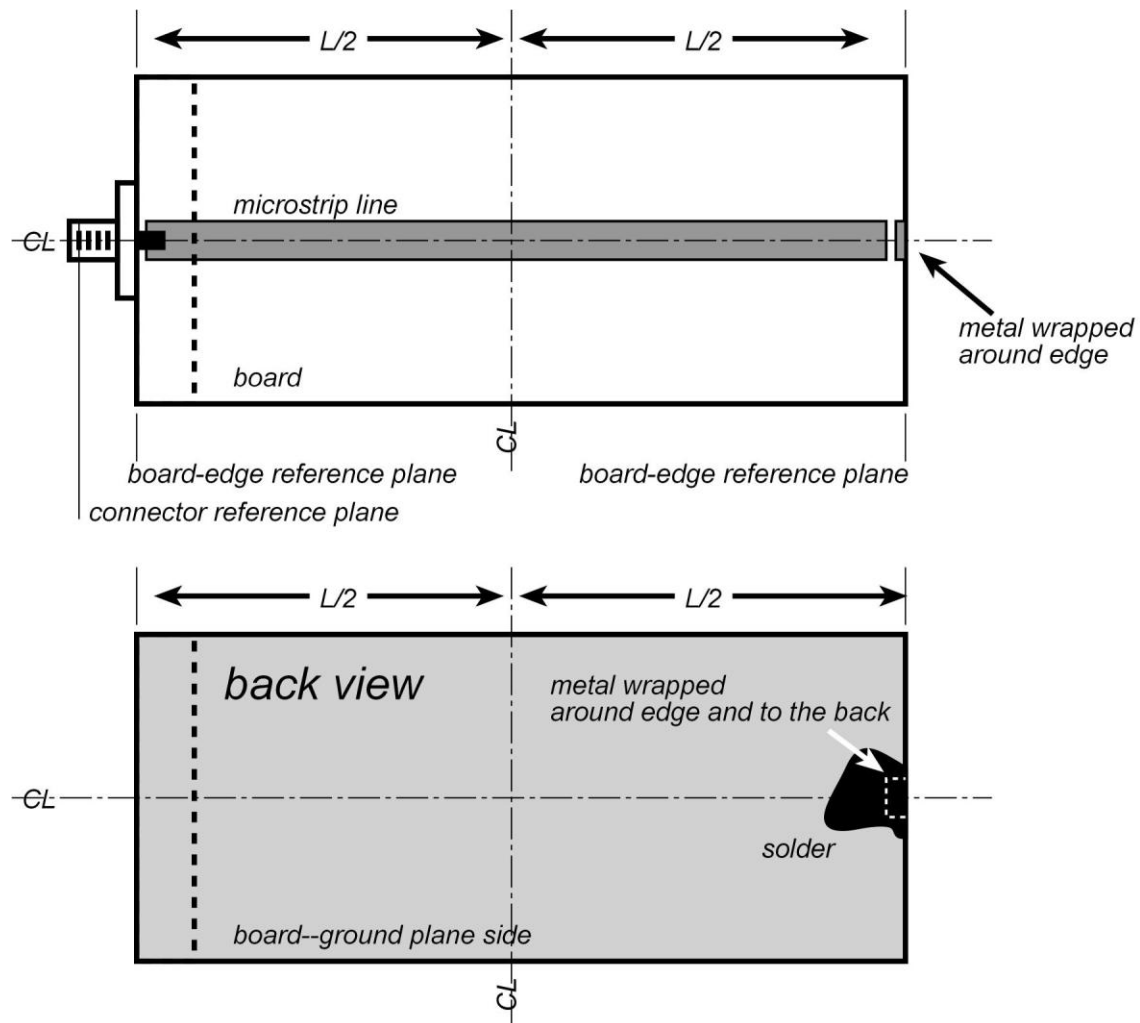


Figure 1: circuit board setup

As before, the line is soldered to the ground plane, around the line back side. Calibrate the network analyzer in coax, measure the S-parameters of the line, and then adjust the reference plane offset until you see an open-circuit on the smith chart. Be sure to write down the value of this reference plane offset.

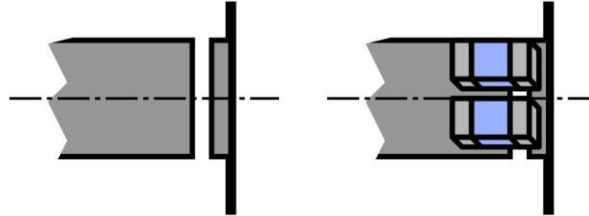


Figure 2: Mounting an RC section at the line end.

Now (Figure 2) mount an RC load at the end of the line. The resistor is 50 Ohms, while the capacitor should be $-j25$ to $-j50$ Ohms at some design frequency at which you will choose yourself. Any frequency between 1GHz and 4GHz is acceptable.

Calibrate the network analyzer, dial in the reference plane offset, and then measure the S-parameters (S11) of this load. Store it in ADS.

Then, design and build an impedance-matching network using series and shunt microstrip lines or shunt radial stubs at your selected design frequency.

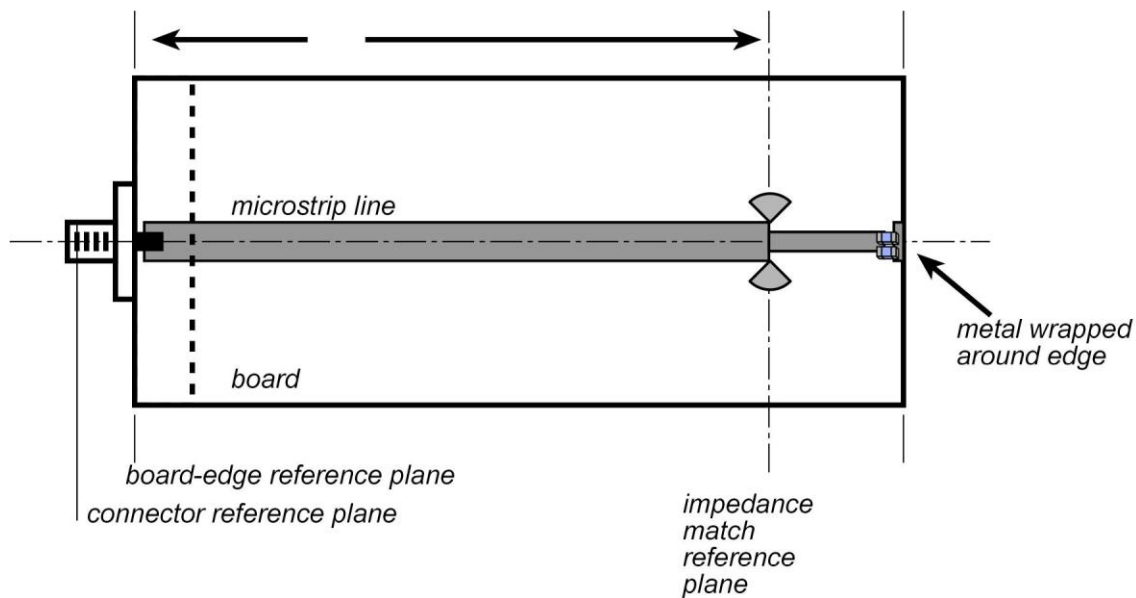


Figure 3: completed impedance-matching network

Measure the S11 of the resulting network. Note that the reference plane has now moved. You will need to invent your own procedure for how to measure and determine the necessary reference plane shift

