BILKENT UNIVERSITY
EE451/551 Microwaves Experiment

Purpose: The purpose of this experiment is to become familiar to reflection measurements using a network analyzer.

Preliminary Work:

(1) Consider the transmission line shown in Figure 1. Calculate the reflection coefficient Γ_{in}, at the input of the transmission line from 10 MHz to 100 MHz with 10MHz steps.

(2) Consider the circuit shown in Figure 2. Calculate the reflection coefficient Γ_{in}, at the input plane of the circuit from 10 MHz to 100 MHz with 10MHz steps.

For both cases, write down a small program and plot the reflection coefficient (both phase and magnitude) versus frequency. The parameters are given on each Figure. Note that during the experiment measure the length of the transmission lines and you may need to update your results accordingly.

Experimental Work:

(1) Calibrate the network analyzer for one port reflection coefficient measurement for a frequency range of 5 MHz to 150 MHz. Verify your calibration on the Smith Chart format by testing the short circuit, open circuit and matched load (50Ω). Your assistant will teach you how to perform the calibration for one port reflection coefficient measurements. In your report, the calibration process should be clearly explained step by step.

(2) Set up the circuit shown in Figure 1 and measure the phase and magnitude of reflection coefficient Γ_{in} (s_{11} for this case) from 10 MHz to 100 MHz with an increment of 10 MHz. Compare your results with the calculated ones. Comment on your results (pay attention to the exact length of the transmission lines).
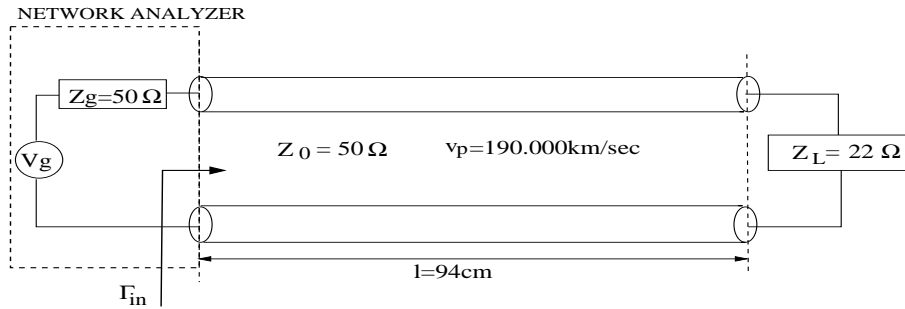

Figure 1: Transmission line terminated with a load impedance.
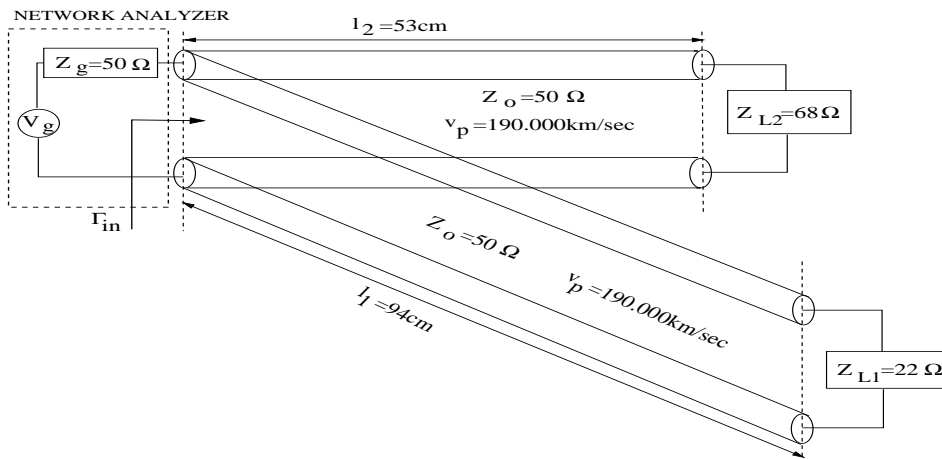
(3) Repeat item (2) for the circuit shown in Figure 2.

Figure 2: Two parallel connected terminated transmission lines.