

Homework 1

Due Thursday, January 24 at 6:00

1) Voltage on a transmission line

As we saw in class, when the load and line are mismatched, the maximum voltage on the transmission line is dependent on position. For a 300Ω load and 100Ω line, plot the total voltage on a few wavelengths of line for $t = [0, \frac{T}{8}, \frac{T}{4}, \frac{3T}{8}, \frac{T}{2}, \frac{5T}{8}, \frac{3T}{4}, \frac{7T}{8}, T]$. Plot the standing wave envelope on the same figure. Use an incident voltage amplitude of 5V and assume that the source and line are matched.

Repeat the plots for a matched load and line.

Repeat the plots for a load that is a short circuit.

All plots should have labels on the axis and the frequency should be indicated.

2) Reflection coefficients and input impedance

In the figure on the next page, an oscilloscope is connected to a coaxial transmission line to monitor the signal. Since we are trying to be sneaky, reflections need to be avoided. What is the minimum frequency that would cause a reflected wave with 10% of the incident voltage? Use 50Ω coax with propagation velocity of $.66c$.

Will we see interference effects using the equipment in the classroom?

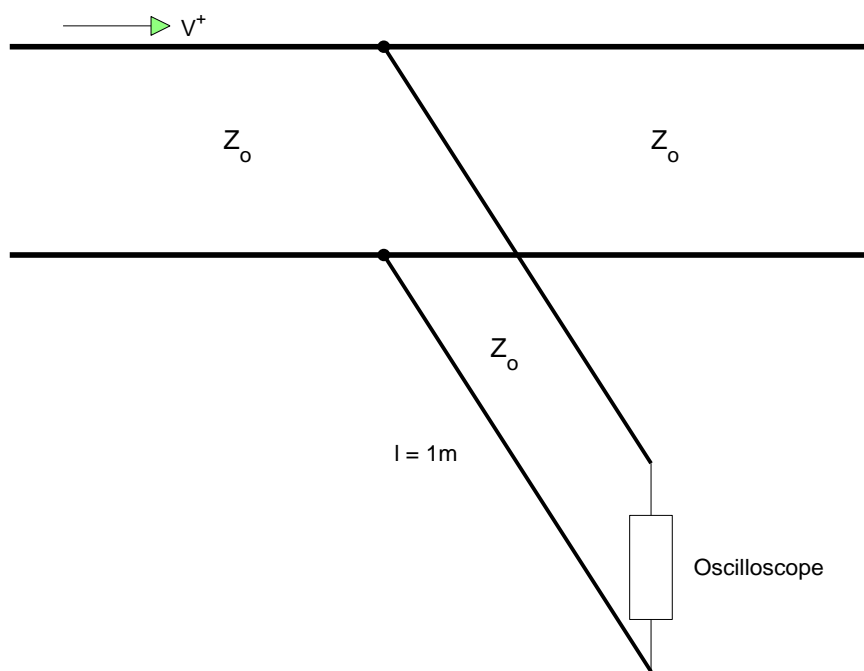


Figure 1: Problem 2 Geometry