# LAB 7 - Computerized Smith Chart

**By:** Greg Swick
Niagara College
Welland, Ontario
Canada

## Purpose:

To perform impedance matching exercises using a computer based Smith Chart.

## Equipment:

- A PC
- Winsmith software or equivalent. (Winsmith is a Noble Publishing product)

## Procedure:

1. Read the document that describes the basic operation of the WINSMITH program. Winsmith is found on the computers in L19A. The document is called Winsmith Pointers and can be found with the lab on the course web page.

## PART A:

Part A serves as an orientation exercise for the use of Winsmith.

1.  Set the reference impedance to 50 ohms. An antenna has an impedance of 150 -j50 and is connected to a transmitter by 18 meters of the 50 ohm polyethylene line at 20 MHz. Enter the electrical length in degrees (you should calculate this ahead of time as a pre-lab exercise).

    Find the following at the load:  a.) SWR_____

    b.) Reflection coeffecient_____

    c.) Input impedance seen by the source _____

    d.) SWR at the source_____

    e.) Reflection coefficient at the source_____

2.  Let your line have a loss of 3dB. Note the change. Now compare the figures for SWR and gamma at the load and source. Account for the difference.

3.  Return to a lossless line. Set the sweep range from 20 Mhz (lower) to 25 MHz (upper). Change the frequency from 20 to 25 MHz in increments of 1 MHz and note the change in the resistive and reactive values of the impedance as well as the location on the impedance circle. Explain why the location of the source changes with frequency.

Perform the following exercises using Winsmith. Provide a printout of your results with your Lab write up. Before printing go to Options and toggle the screen for a white background.

**PART B:**

i.  A 50 ohm source is to be matched to a complex load of 31 -j3 ohms for an operating frequency of 14 MHz. Construct a lumped element matching pi network of 1 inductor and two capacitors. L1 will have a value of 400 nH and C2 will have a value of 90 pf. Tune the value of C1 to complete the match. You may be able to improve the match by fine tuning one of the other components.

In the following exercise use the last two numbers of your student I.D. for X X of the load impedance you will enter: (1XX – j100). For example if your last two numbers are 1 and 2 then the load impedance is 112 -j100.

ii. An antenna presents an impedance of 1XX -j100 to a 72 ohm line. Construct a solution using a single shorted stub using Winsmith for an operating frequency of 100 MHz.