

EE105 Lab Experiments

Labview Tutorial

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1 Introduction

Labview is a software platform providing graphical interface with which you can perform instrument control and data acquisition. Basically, the software platform builds command strings from the user's selection and setting on the graphic interface, send these via GPIB to the hardware to begin the set of measurement. After the completion of these measurement, collected data will be read back and plot on the graphic interface. Data could also be output to a tab-delimited file from Labview, which you could import into dedicated programs like Excel, Matlab, Origin, etc. for further analysis. In EE 105 Labs, the Labview program you will be using is called SpaZilla. We will use that to access the Semiconductor Parameter Analyzer(Agilent 4155C/HP 4145B) to perform I-V measurement for characterization of diode, BJT and MOSFET.

2 Examples

2.1 Initial Setup

1. Press the power button on the parameter analyzer of your station. Allow tens of seconds for the machine to start.
2. Find GPIB address for the parameter analyzer: Double click NI Max icon on your desktop, by referring to the drop-down list shown on the left side of the window as in Figure 1, you could identify GBIP address of the parameter analyzer from the middle number of the string which reads "GPIB0::7::INSTR" (so the address here is 7).
3. Go to folder C:\ SpaZilla , double click the SpaZilla icon in it, click OK to the welcome message. The initial display is shown in Figure 2. There are three dedicated sections:2-terminal device; Generic 2-port model and 3-terminal device from Spazilla. You will be the 2-terminal and 3-terminal measurement in this lab. The details of the setting will be shown in the following examples
4. Input GPIB address number on the bottom left. Specify the name and the path that you want to keep the measured data if you wish.

2.2 2-terminal measurement

You could use 2-terminal mode to measure the I-V of the diode

1. Plug in diode into the socket in the fixture, connect corresponding pins to desired SMUs.

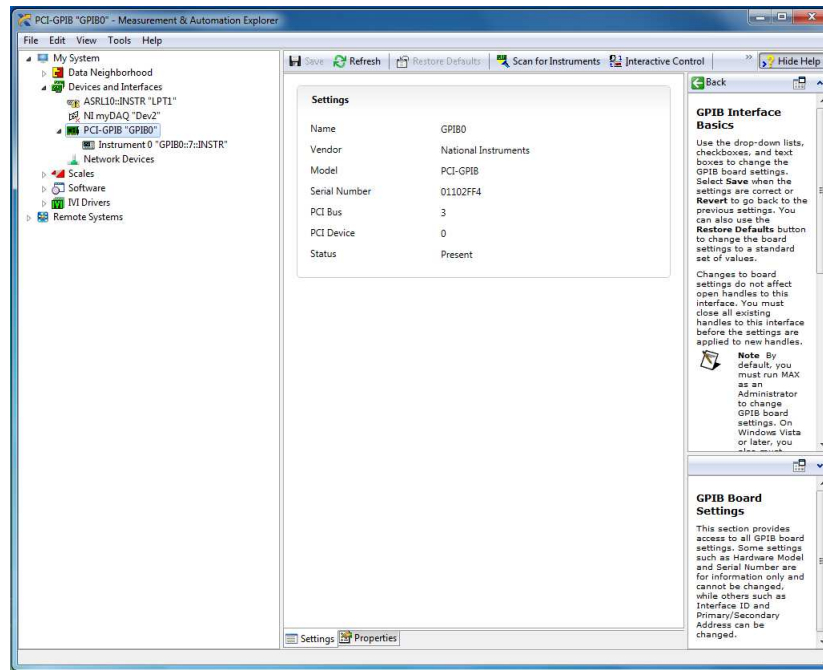


Figure 1: NI MAX window

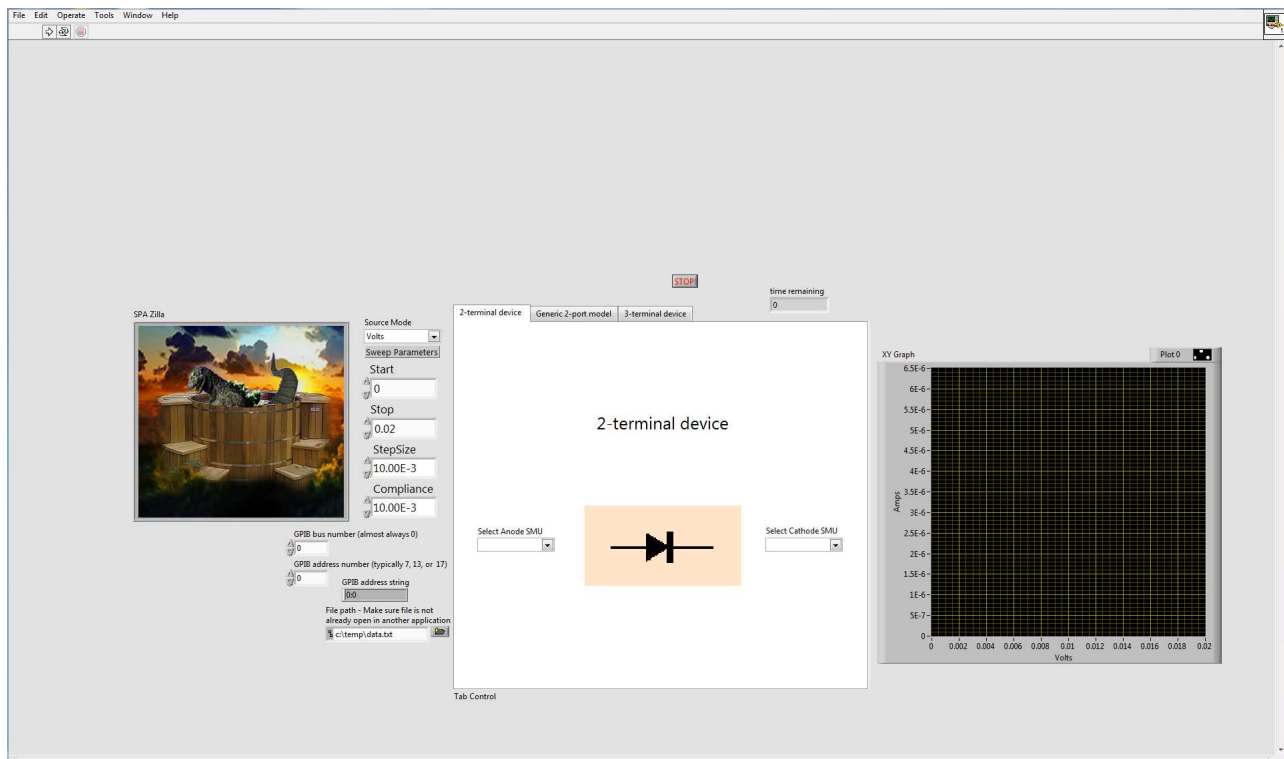


Figure 2: Labview window

2. Select the corresponding SMUs from the drop-down button in the white box. Keep in mind Cathode SMU is grounded in the test.

3. Set "Source Mode" to "Volts", set "Start", "Stop" and "Step Size" according to the lab assignment, set "Compliance" to 100mA on the left side of white box. Keep in mind all this settings are for Anode SMU.
4. Press the white bold arrow on the top left of window. Wait while the instrument performs the measurement and data is retrieved.
5. Check the result of your measurement on the right (An example of the typical I-V of the diode is shown in Figure 3). You could go to the folder where you store the data for further processing and analysis.

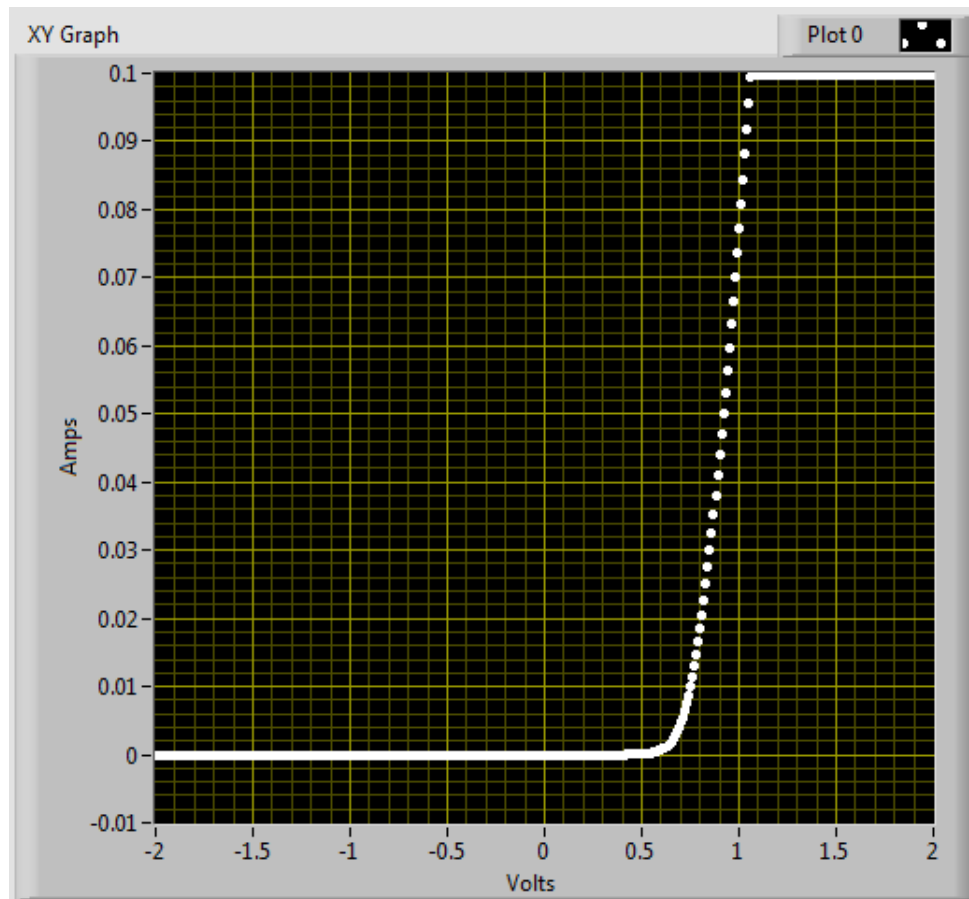


Figure 3: I-V of a diode

2.3 3-terminal measurement

You could use 3-terminal mode to measure I_c - V_{ce} of BJT and I_d - V_{ds} of MOS

1. Plug in BJT device into the socket of the fixture, connect corresponding pins to the desired SMUs.
2. Click 3-terminal device tag, set "Source Mode" within the white box to "Amps", which means you are sweeping current of the Gate SMU (which in BJT case is your base), set "Start", "STEP", "NumOfSteps" according to the lab assignment. Set "Compliance" (here it's in voltage since you are sweeping current) to 10V. Keep in mind Source SMU (here should be your emitter) is always grounded; Drain SMU (here should be your collector) is controlled by the settings on the left of the white box.
3. Press the white bold arrow on the top left of window. Wait while the instrument performs the measurement and data is retrieved.

4. Check the result of your measurement on the right (An example of the typical I_c - V_{ce} of BJT is shown in Figure 4). You could go to the folder where you store the data for further processing and analysis.

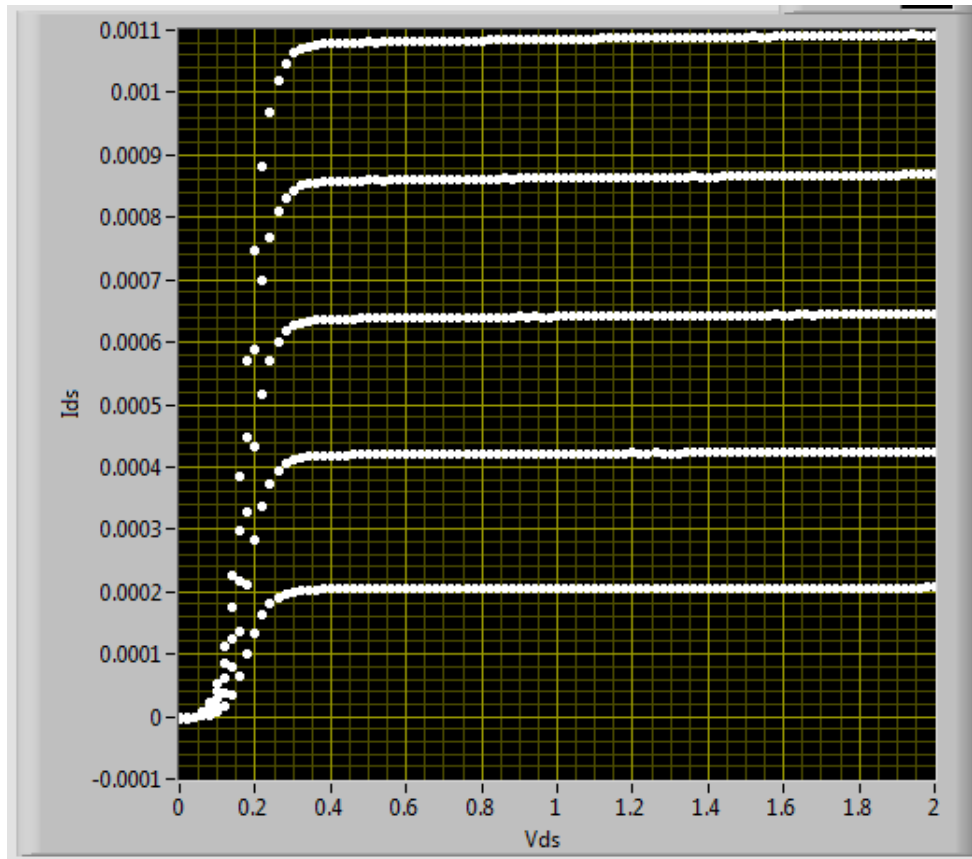


Figure 4: I_c - V_{ce} of BJT

Tip: If there is "buffer full error" shown on the screen of parameter analyzer, try with larger steps to reduce the amount of data measured.