Obtaining hysteresis loop for $BaTiO_3$

MSE 360 - Fall 2009

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WARNING: You will be using high voltages in the circuit when the function generator and power amplifier are on. Be careful.

Instruments used: HP 54603B oscilloscope, function generator, and power amplifier.

1) Prepare your sintered $BaTiO_3$ sample by applying silver paste to both flat sides. You may want to use a metal plate for added structural support, otherwise the sample may break.

2) Use the two clips in the plastic box to connect to your sample. Be sure that each connector only touches one side of the sample, otherwise your sample will short. You'll need to use an insulator or adjust the clips to touch just one side.

3) Turn the oscilloscope on by pushing the **Power** button. Push **Main/Delayed** and select **XY** soft key on the screen. See appendix A for location of buttons.

4) Turn the function generator on. The default frequency will be 1 KHz. You can later change the frequency to 500 Hz by turning the knob or pressing the up/down arrows and observe the change in the obtained curve. Push **Amp**, and you will begin at 100 mVpp. Later, you will increase this value in order to obtain a nicer shaped hysteresis loop. See Appendix B for location of buttons.

5) Turn the amplifier on.

6) On the oscilloscope you will want to change the x and y **volts/div** knobs in order to zoom in on the loop. You can also use the position up/down arrows to offset the wave form.

7) Change the frequency and Amp values until you obtain a hysteresis loop as shown in the literature. It should have a somewhat pointed shape. Be careful to not go too high in voltage b/c you can Overload the amplifier. This will be apparent when your loop is not on the screen anymore.

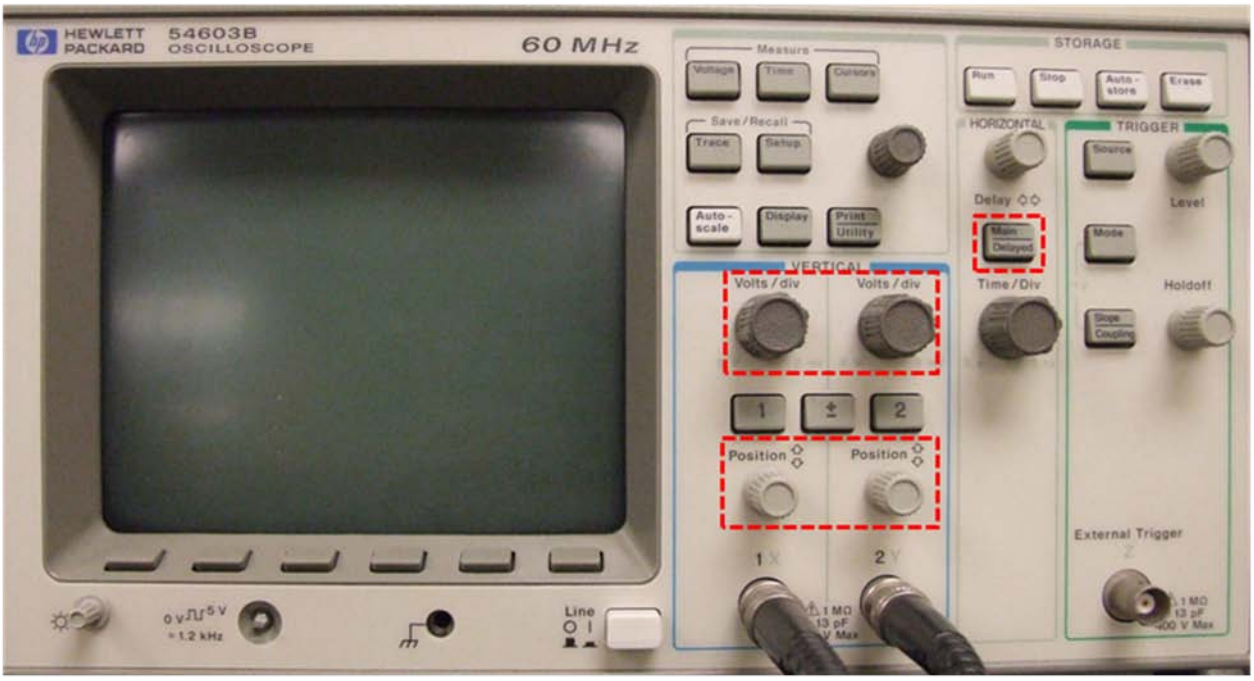
8) Once you have obtained a suitable loop, mark down the Ve and Vp values. The major gridlines in the back are scalable when you adjust the **volts/div** knobs. In the upper left hand corner of the screen you will see what the units are. The actual voltage is multiplied by 1000 from the amplifier. Also note the standard capacitance of the setup.

9) Turn off amplifier. Wait 10 seconds for the sample to properly discharge, then you may swap the samples out.

10) Turn off all instruments when done.

Appendix A: Oscilloscope Interface

Important controls highlighted in red



Appendix B: Signal Generator Interface

Important controls highlighted in red