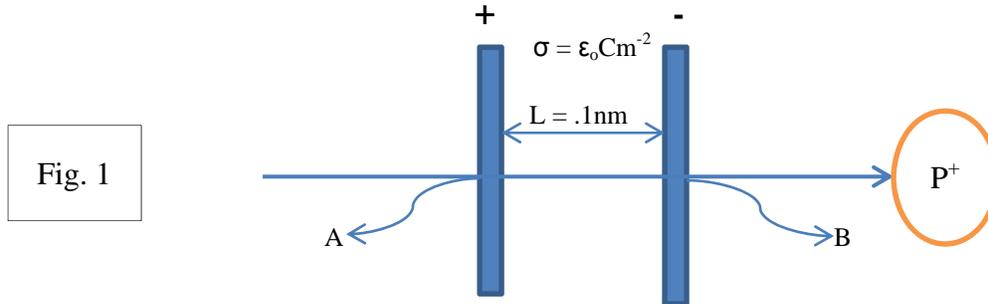


Mississippi State University
Department of Physics and Astronomy
PH 2223 Lab

Electronic Measurements

What are the 2 pieces of equipment we will be dealing with today?

What physical quantities do these instruments measure? (Please include units too)



Last lab we calculated the force exerted on the electron and we were able to calculate the velocity with the help of acceleration information provided by the force. But we never asked the question “what happens, energy wise?” Let us calculate the potential of the electron in between the 2 plates. Familiarize yourself with Gauss’s Law, *Equation 21.3* (P.759) and *Equations 23.10* (P.785), *Equations 23.17* (P.789). What does *Equations 23.17* reduce to if the electric field is independent of position (in other words uniform electric field)?

Calculate the electric field in between the plates using Gauss’s Law. One cannot measure absolute potential, but we can measure potential difference easily, discuss. Mostly potentials are measured w.r.t ground which is considered to be at 0V. In Fig.1, let us assign an arbitrary potential V_+ to the positive plate, is this assignment logical? Now calculate the expression for potential at a distance ‘d’ from the positive plate.

If you did everything right, the ‘V’ should be directly proportional to ‘d’. This is critical to a measurement device. You shall see this turn up again in lab-session 8 on constructing measurement devices.

With the help of potential expressions you derived, calculate the energy of the proton when it is at point ‘A’ and when it is at point ‘B’. Did the proton go from lower energy to higher energy or the other way around? Ask your Lab TA about why it was so, if you were unable to gauge “why?”

Now repeat this process for electrons and tell me what changes will be made in the process of calculation.

Challenge:s

If the oscilloscope is in a time cycle (chopped) of 1ns for each signal, read the lab manual for help. What is the order of frequencies that the instrument can measure? Now let us consider an instrument that can track 2 signals and has a signal alternating frequency of 10^3GHz , considering a sine wave of 1Hz so you expect to see appreciable changes? Now does the instance quoted by the lab manual regarding measurement of high and low frequencies seem logical?