

**Goal - The goal of this lab is to measure the effect of a uniform electric field on a moving beam of charged particles and to show that the force on a moving charged particle is given by  $F = Eq$ .**

**Procedure -**

1. Connect up the electrostatic deflection tube as shown to the right.
2. Turn the high voltage power supply **OFF** and turn the voltage adjustment to **zero**!
3. Connect terminals **D** and **E** of the deflection tube to the **6.3 Volt** terminals of the high voltage power supply.
4. Connect terminal **D** to the **negative terminal** of the **high voltage** supply and connect terminal **C** to the **positive terminal** of the **high voltage** supply.
5. Connect terminal **A** to the **negative terminal** of the **high power supply** and terminal **B** to the **positive terminal** of the **high power supply**. [Reversing these two connections is acceptable!]
6. Turn the high voltage power supply **ON** and then, **gradually**, turn up the high voltage to the deflection tube to approximately  **$V = 4000$  Volts**.
7. Measure and record the position **(x,y)** of the deflected beam as it leaves the deflection grid between the two horizontal plates.
8. Based on the applied accelerating potential **V**, calculate the velocity of the electrons as they pass through the hole in the anode and into the uniform electric field. [Use energy conservation, the **work done** on the electrons by the power supply  **$W = Vq$**  should be equal to the **kinetic energy gained** by the electrons  **$KE = \frac{1}{2} mv^2$** .]
9. Based on the potential applied to the horizontal deflection plates **V** and the distance between the plates **d**, determine the direction and magnitude of the **electric field strength E** between the deflection plates.
10. Determine the time **t** required for the electron beam to reach the position **(x,y)** measured above.
11. Calculate the direction and magnitude of the electric force acting on the electrons and from the time calculated above predict the position of the electron beam **(x,y)**.
12. Compare the actual position of the electron beam with the predicted value and thus confirm if, in fact, the electrostatic force acting on a charge particle in an electric field can be predicted by using  **$F = Eq$** . (Be sure to explain **clearly** how your prediction of the position **(x,y)** above can be used to support your conclusion!)

