SPECIFIC CHARGE OF ELECTRON

1 OBJECTIVE

To determine the specific charge $\left(\frac{e}{m}\right)$ of an electron.

2 REQUIREMENTS

Magnetometer, bar magnet, Cathode Ray Tube

3 INTRODUCTION

One of the major steps in explaining the composition of atoms was made by Joseph John Thomson by measuring the ratio of the electron's charge to its mass, known as the **specific charge** of an electron. The figure shows the various parts of the Thomson apparatus.

Electrons are accelerated from the cathode to the anode, collimated by slits in the anodes, and then allowed to drift into a region of crossed (perpendicular) electric and magnetic fields. The simultaneously applied $\vec{E}$ and $\vec{B}$ fields are first adjusted to produce an undeflected beam. If the $\vec{B}$ field is then turned off, the $\vec{E}$ field alone produces a measurable beam deflection on the phosphorescent screen. From the size of the deflection and the measured values of $\vec{E}$ and $\vec{B}$, the charge-to-mass ratio, $\left(\frac{e}{m}\right)$ may be determined. The truly ingenious feature of this experiment is the manner in which Thomson measured v_x , the horizontal velocity component of the beam. He did this by balancing the magnetic and electric forces. In effect, he created a *velocity selector*, which could select out of the beam those particles having a velocity within a narrow range of values.

4 OBSERVATIONS

Distance d (cm)	Deflection θ_1 (°)	θ_2 (°)	θ_3 (°)	θ_4 (°)	Mean θ (°)	$\tan\theta$	$\tan^2\theta$	V (volts)	y (cm)	Vy V cm

5 PROCEDURE

6 RESULT

The dead time of the GM counter by the double source method is determined to be _____ms.