11/07 SN-01

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The Ratio E/M Lab

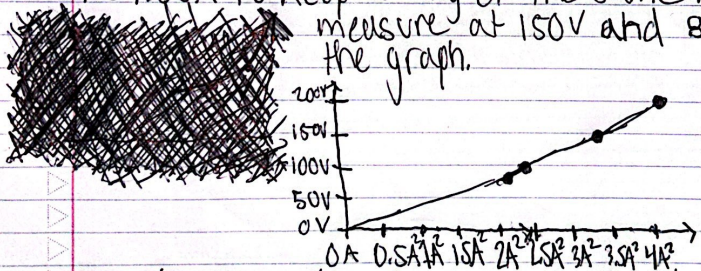
Pre-Lim Exp 1

2A, 8.8V, we observe a green luminescent ring of radius 3cm. As we decrease D.C. Output voltage on the larger supply, the ring decreases in size, and vice versa with increasing voltage. Decreasing magnetic field voltage increases size of the ring.

Experiment 1

We are doing this experiment to graphically verify $\frac{e}{m_e} = \frac{\text{slope}}{r^2(2.737 \cdot 10^{-7})}$

Plate voltage is set at 200V, and coil current is 2A with 8.8V, this produces a 3cm radius ring. When we drop plate voltage to 100V, we decrease coil current to 1.53A to keep a ring of the same radius. We measure at 150V and 80V to complete the graph.



We observe a V/I^2 slope of 43.325, and plugging this in to $\frac{e}{m_e} = \frac{\text{slope}}{r^2(2.737 \cdot 10^{-7})} = \frac{43.325}{(0.03)^2(2.737 \cdot 10^{-7})} = 1.7588 \cdot 10^{11}$ which is the currently accepted value of $1.7588 \cdot 10^{11}$ Coulomb/kg.

Caden Roberts

11/7 5N-01

Pre-Lab The Ratio E/M

1. $\frac{E}{m} = 1.76 \cdot 10^{11}$ $\frac{E}{m} = \frac{2V}{B^2 r^2}$

$$B = \sqrt{\frac{2V}{(\frac{e}{m})r^2}} = \sqrt{\frac{2(100)}{(1.76 \cdot 10^{11})(3 \cdot 10^{-2})^2}} = \boxed{1.124 \cdot 10^{-3}\ T}$$

2. $B = 1.124 \cdot 10^{-3}$ $B = \frac{32\pi NI}{5\sqrt{5}a} \cdot 10^{-7}$

$$I = \frac{(1.124 \cdot 10^{-3})5\sqrt{5}(106 \cdot 10^{-3})}{32\pi \cdot 114 \cdot 10^{-7}} = \boxed{1.114A}$$