What You Measured in the Fewest Words Possible

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I. INTRODUCTION

In the late nineteenth century (1897), J.J. Thomson measured the charge-to-mass ratio of the fundamental charged particle present in a cathode ray, which is a device composed by two metallic plates within a glass tube filled with gas. By the pass of an electric current, one of the plates is heated, giving enough energy to the charged particles in the outer cortex of the plate to escape off the cathode, being accelerated towards the other plate which is configured in a different positive potential. In their path to meet the other plate, these particles interact with the inner gas by inelastic scattering collisions, emitting light that allows the experimentalist to clearly see the path of the charged particles.

By adding to the system a constant magnetic field perpendicular to the direction of these particles, the charge-to-mass ratio (e/m) can be measured by analyzing their dynamics and the geometry of their resultant trajectory from the interaction with the field. One interesting aspect about the experiments performed initially by Thomson, is that after the study of multiple initial conditions such as the usage of different cathode metals and gases, he always reached the same ratio, which was a clear indicator of the discovery of a new fundamental particle: the electron[1].

In this lab, we replicated Thomson's experiment by using the Leybold-Heraeus e/m apparatus, composed by two Helmholtz coils used to supply our constant magnetic field uniform in the neighborhood of the common axis of our coils and a spherical glass bulb, which allowed us to identify by eye clear circular paths of electrons. By applying classical electrodynamics equations, we were able to measure the e/m ratio.

FIG. 1: This is my dog. Her name is Pelusa.

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[1] P. A. Tipler and R. A. Llewellyn, *Modern physics* (W.H. Freeman, 2008), ISBN 0716775506.