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The Effect of Voltage, Vacuum, and Anode Material on Electron Acceleration

The purpose of this experiment was to observe the effects of an electron stream produced by a linear particle accelerator at different voltages, levels of vacuum, magnetic interferences, and anode types, to discover the underlying causes of observable effects of electron acceleration including anomalies, Crookes effect, beam concentration, and the various colors within a particle accelerator. The data was recorded for 5 minutes per test at each minute, the start, and the first 30 seconds. Each test was a combination of 8, 10, 12, 16, 18, 20, 22, or 24 kv of electric energy, with a magnetic interference of either dual upper interference, quad mid interference, or none. Additionally, two vacuum levels (60 and 65 cm) were used, with four different anodes (copper, steel, bronze, and aluminum) per set of tests. The hypothesis was partially supported by the data. During testing a few observable trends were noticed, including that vacuum level determined whether or not there was a stream and beam concentration stayed relatively the same per voltage. Post-testing the data was analyzed and revealed a few major influences of the dependent variables. It was found magnetic interference led to higher Crookes effect and beam color was most influenced by the anode material. The main conclusions drawn were that vacuum is the greatest influence in particle acceleration, magnetic interference is the biggest influence in Crookes effect, and all of the amazing anomalies discovered throughout the testing were most influenced by anode material.