

Electrons in a Magnetic Field
PRE-LAB SEMESTERS

- 1) Read the lab write up.
- 2) Do the field calibration, as described on page 4 of the lab write up. Analyze the calibration data, as described on page 5 of the write-up.
- 3) Switch to the “real” apparatus, with the tube. Fire it up and get a ring of electrons visible. Figure out how the sliders work on the real apparatus- not just how to slide them, but how to use the reflection to get a parallax free measurement of the radius. If you can do this, your data-taking will go much better next week.
- 4) Derive Equation 6 from Equation 5 for the Helmholtz coil geometry. Derive Equation 5 using the Biot-Savart Law: this is a completely standard University Physics problem.
- 5) Note that Equation 6 boils down to $B=(\text{constant})I$, where the constant is a geometrical fudge factor that contains the details of the coil geometry (number of turns, size, etc). This is ALWAYS true for an air filled magnet. How do you justify this from the Biot-Savart law?
- 6) How do you convert Gauss to Tesla, for a measurement of magnetic field?
- 7) Approximately what is the earth’s magnetic field at the earth's surface, in Gauss? Look this up in any resource you find convenient. Record your source.