Electrodynamics (PHYS 480) Sixth Guide

Fall 2014 v1.1

In Chapter 6 we launch into magnetized matter. The strategy is the same as before - first, what does a bit of matter do when exposed to a **B**-field? Then we determine what the effects are in macroscopic bulk materials. Surprisingly the same tricks work, although instead of bound charges we have bound currents. Perhaps not surprisingly (after all we have *magnets* in this world) the array of possible effects is greater in the magnetic case.

Reading: Chapter 6

Problems of note:

(1) 5.37 The magnetic moment of the spherical shell of Example 5.11
(2) 5.33 Finishing the BC's for **A**.
(3) 5.40 Finding the locations of charge in a current carrying wire. Hint: To start assume that the mobile charges *do* move to the center. Find the E and B fields that yield an equilibrium.
(4) 5.41 The Hall effect
(5) 5.47 On the very handy Helmholtz coils
(6) 6.1 On the interaction of current loops
(7) 6.6 Trying out the classical models
(8) 6.7 Make a parallel and it is short.

Notes on text:

- READ Problem 5.34 A coordinate independent form of the dipole field
- page 267 What happens to the current loop if the magnetic field decreases in the x direction?
- page 269 Take note of the Gilbert model. You could add the precise relations, including the exceptions in parenthesis.
- page 272 In class we jump ahead to explain Griffiths' footnote.
- page 288 If you are curious, look up the quantum description of ferromagnetism. The Feynman Lectures Vol II sections 36 (esp. 36.6) are nice though they require some background provided in section 34.7.

Extra Stuff:

- Summarize the new "magnetic zoo." Draw the parallels with the electrostatic definitions in section 4.4.