

January 2007

## Magnetic Torque – *DRAFT*

Phy 344/462

### **Introduction:**

A magnetic dipole moment  $\vec{\mu}$  in a magnetic field will experience a torque given by:

$$\vec{\tau} = \vec{\mu} \times \vec{B}. \quad (1)$$

For this project, you will perform several experiments to investigate this magnetic torque, following the descriptions in the student lab manual from TeachSpin.

*This apparatus just arrived in January 2007 and is being run in this course for the first time. There will likely be some adjustments to the procedures and assignments as the students (and the instructor and TA!) learn the operation of the system. Please be patient. It should be an exciting project!*

### **Objectives**

- Measure the torque experienced by a magnetic dipole in a magnetic field.
- Study the consequences of this torque.
- Investigate the force on a magnetic dipole in a magnetic field gradient

**Suggested Reading:** Review an electromagnetism textbook, such as Griffiths, *Introduction to Electrodynamics* for background material on the torque experienced by a magnetic dipole in a magnetic field and the net force on a magnetic dipole in a magnetic field gradient.

### **Suggested Apparatus:**

1. Magnetic torque apparatus from TeachSpin.
2. Balance for measuring mass of ball.

## Experiments

1. Comparing magnetic and gravitational torques
2. Harmonic oscillation of a spherical pendulum
3. Precessional motion of a spinning sphere
4. Net force in a magnetic field gradient