**MAGNETIC FORCE 2**

Aditya Balwani

PARTNER: Michelle Chan

PHY 134

SECTION 07

TA: PETER JONES

DATA TAKEN: 10/22/2014

LAB DUE: 10/27/2014 at 10:00AM

LAB HANDED: 10/27/2014

**Aim:**

To measure the Torque and the Force between 2 current carrying 2 Helmholtz coils and a 100 turn coil

**Procedure:**

**1)** First measure the Diameter of the Helmholtz coil and use the radius to find its area

**2)** Measure the dimensions of the 100 coil wire and then find its area

**3)** Remove all mass from the scale and zero it. Place one 1g weight on the scale. If the measurement is within 3%, its fine.

**4)** Put the brass weight back on the coil and position of lever arm as needed.

**5)** Zero the scale and place one 1g weight on the scale and turn on the current. In both the coils. Measure the current and voltage needed to get the scale back to zero

**6)** Repeat the process for 2, 3 and 4 grams of mass.

**Data Analysis:**

Using the data collected, we find the Vertical component of the earth’s magnetic field to be 0.00465 ± 0.001081T

**Q1) Using Fig. 1 as a reference, in what direction does the gravitational torque produced by the counterweight(s) point**

The torque points away from the screen.

**Q2) In what direction must the magnetic torque point in order to compensate the gravitational torque?**

The Magnetic torque must point in the opposite direction, out of the screen

**Q3)**  **What is the uncertainty associated with your measurement of the mass of one piece-of-wire counterweight?**

The uncertainty in the measurement of the mass of the hook is ±0.001g

**Q4)**  **How can you reduce this experimental uncertainty?**

We can reduce this experimental uncertainty by reducing factors such as wind that could effect the scale and using more accurate scales and by making sure the hook is in the center.

**Q5)**  **How can we exploit this identicality?**

Since the hooks are all designed to be identical, we don’t have to measure the mass and uncertainty of each one, we can simply assume them to be identical.

**Q6)**  **What is the numerical value in SI units of the gravitational torque produced by the one-gram mass hung from the hook?**

0.00264 ± 0.0001 N.m

**Q7)**  **Why use the largest steady value of current?**

A Large current will produce a larger torque which would be easier to measure.

**Q8) What could be the cause of a non-zero scale reading when the 100-turn coil is powered up?**

When the 100 turn coil is powered up, it creates a field around it which interacts with surrounding objects and earth’s magnetic field which may cause a Non-zero value.

**Q9) Is the plot linear? What is its slope? What is the uncertainty in the slope? Use a max-min graphical analysis. What does your plot demonstrate?**

Yes, the plot is linear with a slope of -2.253\*10^-4 ± 0.211. The plot shows that the Torque m is directly proportional to the Torque due to mass.

**Conclusion:**

Using various experiments we successfully found the torque between a Helmholtz coil and a 100 turn coil



