PHYSICS LABORATORY: The Magnetic Field

Adapted from: Vernier Physics

BACKGROUND INFORMATION AND PURPOSE

A bar magnet is called a *dipole* since it has two poles, commonly labeled 'north' and 'south'. The magnetic field B_{axis} (measured in tesla) of an ideal dipole measured along its axis has been found to be:

$$B_{axis} = \frac{\mu_0}{4\pi} \frac{2\mu}{d^3}$$

where μ_0 is the permeability constant ($4\pi \times 10^{-7}$ T mA^{-1}), d is the distance from the center of the dipole in meters and μ is the magnetic moment. The magnetic moment μ measures the strength of a magnet, much like electrical charge measures the strength of a electric field source.

In this lab, you will:

1. verify the above relationship, and come up with a value for the magnetic moment of your magnet.

2. Establish a relationship between the number of magnets and the magnetic moment.

DATA COLLECTION AND PROCESSING (DCP)

1. Think very carefully about how you are going to collect and process the data.
2. Think very carefully about your independent, dependent, and controlled variables.
3. A full error analysis with proper treatment of uncertainties is required.
4. Keep in the mind the magnetic field pattern around your magnet, as this will help you determine the best way to get appropriate data.

CONCLUSION AND EVALUATION (CE)

1. Interpret your results based on your data.
2. Identify weaknesses to your methodology and how you would improve upon them.
3. Describe two related labs with proper variables defined.

Remember:

1. **Refer to the 'Physics Lab Report Guide' before submitting your report.**
2. **Attach the 'Physics Lab Report Rubric' as a cover page to your paper copy.**

You will be marked on Data Collection and Processing (DCP) and Conclusion and Evaluation (CE) for this lab.