

Experiment 6

Testing Experiment of Biot-Savart Law

1. Objectives

Train student to apply Microcomputer Based Laboratory (MBL) system in physics experiment of electromagnetic phenomenon. Execute Biot-Savart law verification experiment using the MBL system.

2. Apparatus/ Materials

- 1) Computer
- 2) Biot-Savart Law Apparatus
- 3) Vernier board circuit
- 4) Vernier current sensor
- 5) Vernier Magnetic field sensor

3. Applying Concept

By applying Biot-Savart law of magnetic field affected by electric current, the magnetic field by the loop of the circular current at points in the line through the center of the node and perpendicular to the plane of the loop is expressed by the equation:

$$B_x = \frac{\mu_0 IR^2}{2(x^2 + R^2)^{3/2}} \quad (1)$$

If the coil with the same radius consist of N loop, then the total magnetic field is:

$$B_x = \frac{\mu_0 NIR^2}{2(x^2 + R^2)^{3/2}} \quad (2)$$

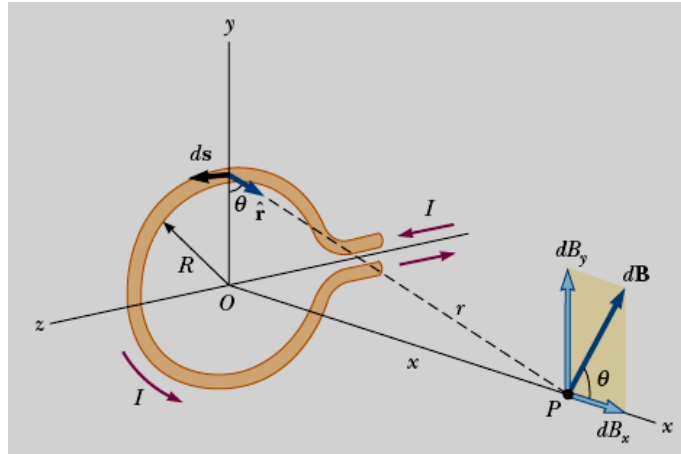


Figure 1. Biot-Savart law for a single point around a coil

For $x = 0$ it means B is in the center of the coil, then the value of B is:

$$B_x = \frac{\mu_0 NI}{2R} \quad (3)$$

4. Procedure

Part 1 prove the correlation of magnetic field dependence on current

- (1) Arrange available materials and experiment tools
- (2) Do the measurement of magnetic field as current function, present data in tabular form.
- (3) Analyze gained data to verify Bio-Savart law by regression analysis.

Part 2 verify the dependence of magnetic field to electric current.

- (1) Arrange available materials and experiment tools
- (2) Do the measurement of magnetic field as x function, present data in tabular form.
- (3) Analyze gained data to verify Bio-Savart law by regression analysis