**Magnetic Fields and Induction**

For this lab, you will be exploring magnetic fields and induction.

**Part 1: Magnetic field due to a long solenoid.**

Your TA has measured the length, diameter and resistance for the solenoid that we will be using. Record the measured values.

$$L\_{S}=$$

$$D\_{S}=$$

$$R\_{S}=$$

Recall the formula that was derived in lecture for the field inside a long solenoid.

$B\_{S}=$

What quantities must be measured to determine the number of turns for the solenoid? Your TA will measure the necessary quantities (if asked to do so).

Record the measured quantities and compute the number of turns for the solenoid.

What are the limitations for using the formula for the field inside a long solenoid? How might you experimentally determine the limits of applicability? Your TA will take the measurements necessary to determine the limits of applicability (if asked to do so).

Record the measured quantities and perform additional computations, if necessary to determine limits of applicability.

**Part 2: Magnetic field due to a ring.**

Your TA has measured the length, diameter and resistance for the ring that we will be using. Record the measured values.

$$L\_{R}=$$

$$D\_{R}=$$

$$R\_{R}=$$

Recall the formula that was derived in lecture for the field inside a long solenoid.

$B\_{R}=$

What quantities must be measured to determine the number of turns for the ring? Your TA will measure the necessary quantities (if asked to do so).

Record the measured quantities and compute the number of turns for the ring.

What are the limitations for using the formula for the field inside a ring? How might you experimentally determine the limits of applicability? Your TA will take the measurements necessary to determine the limits of applicability (if asked to do so).

Record the measured quantities and perform additional computations, if necessary to determine limits of applicability.

**Par 3: Induction**

The solenoid will be placed at the center of the ring and will carry an alternating current. Determine the induced current that will be expected in the ring.

$I\_{calc}=$

Your TA will measure the current induced in the ring. What other quantities must be known in order to compare the calculated induced current with the measured induced current? Your TA will measure or provide the necessary quantities (if asked to do so).

Record the measured current.

$I\_{meas}=$

**Additional information for reports:**

Include

* descriptions of measurements,
* sketches of experimental setups,
* organized presentation of results (such as tables or graphs),
* comparisons to calculations,
* discussion of errors,
* modifications or extensions that could be investigated and
* discussion of results.