

Mutual Inductance

Name: _____

Instructor: _____

Team Member 1	Team Member 4
Team Member 2	Team Member 5
Team Member 3	Team Member 6

Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for each step. Box final mathematical results. Do not forget the units.

Data

1. Measure and record the diameter of the secondary coil. Also, record the number of turns it has.
2. Record the length and number of turns of the primary coil.
3. For your resistor, measure and record its actual resistance.
4. Using the Oscilloscope, set the signal generator to a 1 kHz sinusoidal wave. Measure the period of the wave and write it down.
5. After setting the circuit of Figure 3 of the lab manual, vary the voltage drop across the resistor from 2 to 12 V (peak-to-peak) in increments of 2 V. Make a table to record each voltage drop across the resistor, and the corresponding voltage across the terminals of the secondary coil.

6. After introducing the metal core into the secondary coil, repeat the previous step.

Analysis

1. For each voltage across the resistor, use Ohm's law to calculate the peak-to-peak value of the current flowing through the resistor and then apply Kirchhoff's node law to determine the peak-to-peak value of the current flowing through the primary coil. Include these values in the Data tables above.
2. For the data corresponding to the Air core on the secondary coil, use the provided graph paper to make a scatter plot of the peak-to-peak values of the voltage on the secondary coil and the peak-to-peak values of the current flowing through the primary coil (use the x-axis for the current). Draw the best fit line.
3. Repeat the previous step for the data corresponding to the metal core. Plot these data on the same axis as the data for the air core.
4. Determine the slope for each of the best fit lines.
5. From the period of the input signal, determine the angular frequency.
6. Use the slope from the best fit line and equation (8) from the lab manual to obtain the experimental values of the coils' Mutual inductance for both, the Air and metal core cases.
7. Use equation (10) and the experimental value of the mutual inductance to determine the value of μ for air and the metal core.

8. Compare the value of μ for air with the value of μ_0 .

