# LAB 9 Report (Energy in fields)

## Abstract

The aim of the experiment is to determine the relationship between the energy content of an electric and magnetic field and their respective field strengths in a circuit consisting of a capacitor and a coil of wire. The setup involves observing oscillations in the circuit and deducing a power-law relationship between the electric and magnetic fields and their energies.

**What is the correct fitting function of the data?**

The correct p value fit for the graph $(\frac{x}{11.2})^p + (\frac{y}{8.4})^p = 1$ is 2.

**What can you conclude from the shape of the fitting function?**

The shape of the fitting function is in the shape of an eclipse, the max/min VR/VRm in the y direction is less than the max/min VC/VCm. In addition when max/min of the VR/VRm would mean that the VC/VCm is at zero. In addition every point of the graph has to have a combined value of one.

**What is the correct equation of the energy in the electric and magnetic fields?**

From the equation $(\frac{x}{11.2})^p + (\frac{y}{8.4})^p = 1$ The conductor represents x/11.2 while the inductor represents y/8.4.

## Procedure

The materials required in the lab are Heath coils, capacitors and an oscilloscope. First arrange the circuit. First arrange the circuit to contain components such as the capacitor, coil, resistor, and oscilloscope. Next connect the channels 1 and 2 of the oscilloscope across the resistor and the capacitor and adjust the sine wave generator's frequency to resonance. Next take 10 different measurements at various points over a cycle of oscillation and lastly plot all ten points of Plot V_R/V_{Rmax} vs. V_C/V_{Cmax} with a table in desmos and map the p value that matches the table the best, of $x^p + y^p = 1$.

## Raw Data

| Trial # | V_C | V_R | x | y | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.8 | 6.8 | 0.607143 | 0.809524 | | | | |
| 2 | 10.8 | 2.4 | 0.964286 | 0.285714 | | | | |
| 3 | 10.8 | -2.4 | 0.964286 | -0.28571 | | | | |
| 4 | 6.0 | -7.6 | 0.535714 | -0.90476 | | | | |
| 5 | 0.4 | -9.2 | 0.035714 | -1.09524 | | T_Cmax | 11.2 | V |
| 6 | -6.4 | -7.2 | -0.57143 | -0.85714 | | T_Rmax | 8.4 | V |
| 7 | -10.4 | -2.0 | -0.92857 | -0.2381 | | | | |
| 8 | -10.0 | 2.4 | -0.89286 | 0.285714 | | | | |
| 9 | -5.2 | 7.6 | -0.46429 | 0.904762 | | | | |
| 10 | 0.0 | 8.4 | 0 | 1 | | | | |
| 11 | 11.2 | 0.0 | 1 | 0 | | | | |

## Calculation and Reasoning (Graph and Explanation)

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