

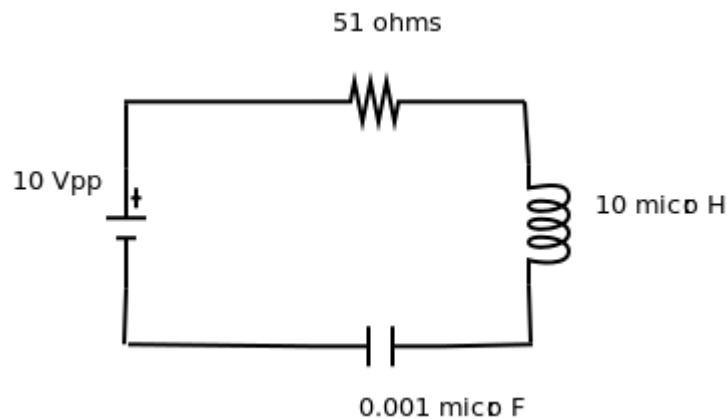
EE 221L Free Lab Experiment

Topic: Mutual Inductance

Purpose: The purpose of this lab is to send power between two separate circuits by placing one inductor inside the magnetic field of another.

Preliminary: When current is ran through an inductor, a doughnut shaped magnetic field is created around the inductor. When another inductor is placed inside of this magnetic field, its electrons react to the field and create current. The strength of the magnetic field can be optimized by adding a capacitor and resistor in series with the inductor and adjusting the input voltage frequency so that the inductor and capacitor resonate with one another.

Find the resonance frequency of the RLC circuit below.



Experimental:

- 1) Create two identical inductors by winding magnetic wire around a 3 inch cylinder an equal number of times (~5). Compress the coils and tape them into one ring. Sand both ends of the inductor to remove the non conductive coating on the wire. Measure and record the value of the created inductors. These should be near the same value.
- 2) Choose one of the lab capacitors to pair with your inductors. Calculate and record your resonance frequency. A resonance frequency in the MHz is desired.
- 3) Wire the series RLC circuit analyzed in the prelab. Use the function generator to input a 10 Vpp sine wave with the calculated frequency. Attach the first probe of the oscilloscope to the resistor to validate the input values.



- 4) Connect an LED to the second inductor. This will be the receiving circuit that uses the power in the magnetic field created by the first inductor.

5) Move the circuits together with the inductors aligned. The LED will turn on with its brightness changing depending on the range between the two circuits.

Postlab:

Why does the LED only turn on when the inductors are aligned?

This circuit only works using an AC source. What would need to be done to a DC signal in order to make the circuit work?

What would happen if the inductors used had different values?