Electromagnetic Oscillating Circuit

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ABSTRACT:

This experiment demonstrates the principles of LC oscillation under different values of Inductance, Capacitance, and Resistance. This is analogous to mass-spring system with inductor and capacitor acting like mass and spring respectively. The simulation can be used to understand the interplay of energy between these components and the effect of a resistor as a damping mechanism. The following concepts we will explore in this app:

I. Finding the frequency of the oscillation
II. V-I plot and phase difference
III. Conservation of energy in LC oscillation

We can understand the EM Oscillating Circuits by writing the second order linear homogeneous differential equation for charge:

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0$$

Where:

- L is the inductance of the inductor (in henries).
- R is the resistance of the resistor (in ohms).
- C is the capacitance of the capacitor (in farads).
- q is the charge on the capacitor (in coulombs).

In ideal circuit R= 0 thus there is no dissipation of energy and the oscillation goes on forever with the frequency

$$\omega = \frac{1}{\sqrt{LC}}$$

KEYWORDS:

Electromagnetic Oscillating Circuit, resonance frequency, resistance, inductance, capacitance, charge, dissipation, differential equation.