

Resistors, Inductors, and Capacitors in Circuits

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1 Introduction

1.1 Background

In DC circuits, resistance is the only form of opposition the current faces.

In AC circuits, however, the oscillating nature of the current induces a second form of opposition called *reactance*. This occurs mostly in inductors & capacitors, though the exact mechanism by which the alternating current causes this is different in the two components.

Inductors

Inductors are components used for a variety of reasons (energy storage, magnetic field manipulation, filters), but at their simplest they consist of a conductive material coiled around a "core" of some material that serves to confine the magnetic field induced by the current running through the conductor better.

Current gives rise to a magnetic field as illustrated by Ampère's Law. It stands to reason, then, that a *changing* current (such as AC) gives rise to a *changing* magnetic field. A changing magnetic field, however, is opposed due to Lenz's Law, resulting finally in a "back-emf" that diminishes the original current through the inductor. This is the *inductive reactance*, symbolized by X_C .

Capacitors

Capacitors, like inductors, also store energy, but they store it in the form of electric potential energy. This is generally accomplished through the separation of two conductors by a dielectric, between which an electric field arises when an electromotive force is supplied due to the accumulation of opposing charge on either conductor. With a constant current,

1.2 Objective

The object of this lab is to gain an understanding of and familiarity with and reactance in resistor-capacitor (RC), resistor-inductor (RL), and resistor-inductor-capacitor (RLC) circuits. This will be achieved mainly through the use of a breadboard, function generator, and oscilloscope.

1.3 Theory

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2 Procedure

3 Data

3.1 RL

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5 Questions