

# **Birzeit University**

## **Physics 112**

Experiment #9

### **Resonance**

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## **Abstract:**

- **The aim:** to find the resonance omega and quality factor of a  $I$  vs.  $\omega$  graph, at two different values of resistance.
- **The method:** by finding the measure the voltage and current at different frequencies, by using DCO and Signal Generator to experimentally.
- **The main Result:**

**At  $R=1k$**

$$Q=0.36$$

**At  $R=2k$**

$$Q= 161.0$$

**Angular resonance frequency**

$$\omega = 30.86 \text{ K rad per second}$$

## Introduction:

In this experiment, it is expected to use the DCO and Signal Generator to experimentally and theoretically identify the resonance omega and quality factor, using a  $I$  vs.  $\omega$  graph. To find both: would be to measure the voltage and current at different frequencies, as well as at a resistance equal to  $1K\Omega$ , and another at  $2K\Omega$ .

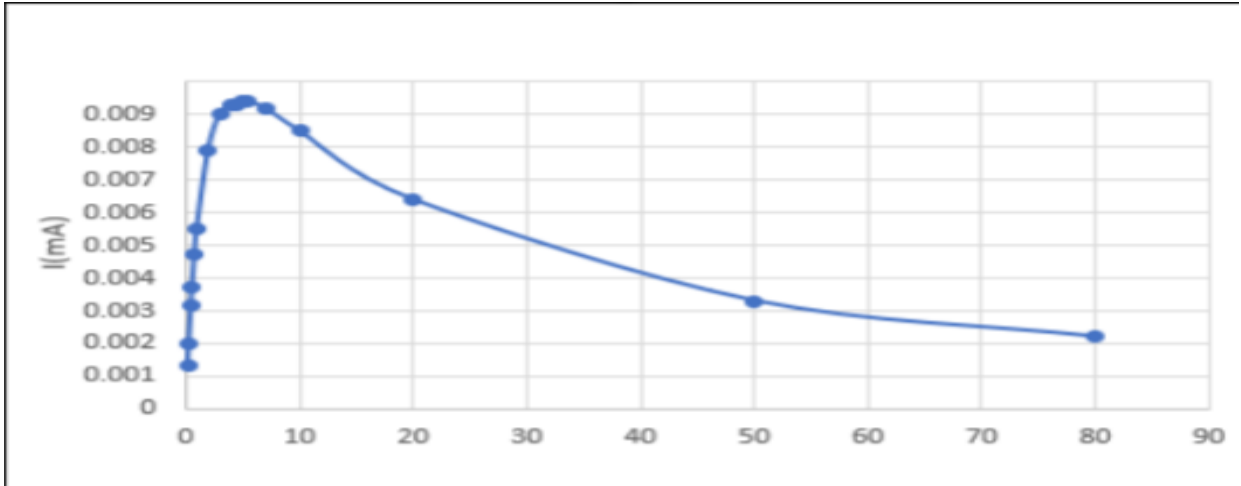
The amplitude of the current passing through the circuit given by :

$$I_0 = \frac{V_0}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

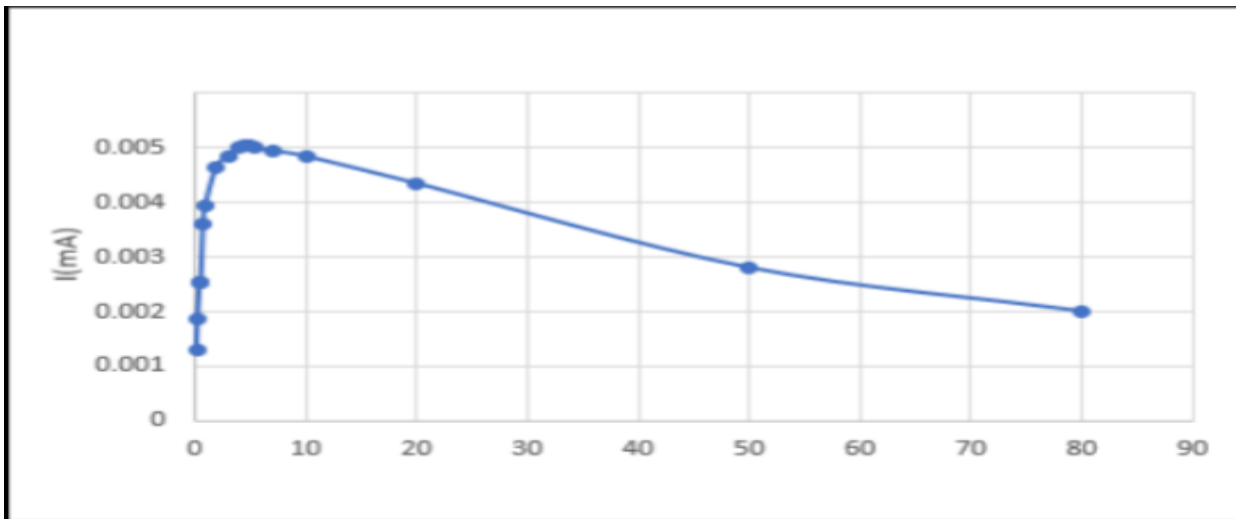
The current in the circuit assumes its maximum value when the driving voltage frequency equals the natural frequency of RLC circuit. This phenomenon is called resonance.

A measure of the resonance curve is a quantity called the quality factor ( $Q$ ) which is defined as

$$Q = \omega L / R$$



This is graph for function of frequency of **1K** (ohms)



This is graph for function of frequency of **2K** (ohms)

## Results and Conclusion:

In this experiment, we are found that current in an RLC circuit has reaches a maximum when frequency is equal to the resonant frequency at two different values of resistance It was discovered that at  $R=1K$  Ohms and  $R=2K$  ohms, the  $I$  vs.  $\omega$  graph, when driving voltage frequency is equal to the resonant frequency directly reaches a maximum. We can also conclude that the greater the resistance in an RLC circuit, the small the quality factor.

displayed a resonance frequency These experimental values had a large percentage error, when relating it to the theoretical values. As for when  $R$  was equal to  $2K\Omega$  the  $I$  vs.  $\omega$  graph,