

Physics Department

Physics 112

Experiment 8 : Impedance and reactance

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Abstract :

**The aim of experiment is** **to** find the phase shift of some components (

Capacitor, inductor, resistor) and find the resonance frequency .

**The main result is : .**

Data :

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency |  | w |  |
| 0.1 | 0.0025 | 0.628 | 0.00157 |
| 0.3 | 0.00074 | 1.884 | 0.001394 |
| 0.5 | 0.0004 | 3.14 | 0.001256 |
| 0.7 | 0.00025 | 4.396 | 0.001099 |
| 1 | 0.00015 | 6.28 | 0.000942 |
| 3 | 0.000018 | 18.84 | 0.000339 |
| 4 | 0.000006 | 25.12 | 0.000151 |
| 4.5 | 0.000002 | 28.26 | 5.65E-05 |
| 4.8 | 0.000001 | 30.144 | 3.01E-05 |
| 5 | 0 | 31.4 | 0 |
| 5.2 | -0.0000012 | 32.656 | -3.9E-05 |
| 5.5 | -0.0000024 | 34.54 | -8.3E-05 |
| 7 | -0.0000048 | 43.96 | -0.00021 |
| 20 | -0.0000066 | 125.6 | -0.00083 |
| 50 | -0.0000042 | 314 | -0.00132 |
| 70 | -0.0000032 | 439.6 | -0.00141 |
| 100 | -0.0000025 | 628 | -0.00157 |

The graph below presents the phase shift vs the frequency :

Calculations :

From the graph :

At f = 5KHz , , so

**Theoretical:**

= 5035.47 Hz

Results and conclusion :

This experiment discussed the phase difference between the graphs of resistor voltage and voltage input. It was found that all values of Δt were at a higher value when frequency was at a lower value, but slowly started to decrease as frequency increased. However, after the frequency, 5 KHz, the time half and phase shift were equal to 0, the frequency and time-half began to increase. Therefore, determining that frequency and time-half have an alternating relationship where their graph would be a cosine graph.

The theoretical and exponential values for the phase shift and omega had been proven to be similar with a small percentage error. As for the phase shift vs. Omega graph, it was shown to be an exponential decay due to the negative values received after Δt is equal to 0.