# Experiment #7

“To determine the frequency of AC current by sonometer”

# THEORY

The sonometer allows accurate variation of the tension in the wire, by hanging a series of masses from the end arm, and the length of the wire by moving the bridges. may also be varied by using different wire thicknesses. A pickup coil is used to detect the vibrations. A second drive coil can be used to induce vibrations in the wire.

The pickup coil is connected to the input of an amplifier which allows you to hear the vibrations. The output of the amplifier is connected to the CI-6508 input adaptor which in turn is connected to analog channel A of the 700 Interface box.

The computer acts as an oscilloscope allowing the frequency of the vibrations to be recorded. Data acquisition can be started and stopped by clicking on MON and STOP respectively. Within the scope window the scales of the horizontal and vertical axes can be changed by clicking on the small buttons with the saw tooth icons. It is important to change the scales before you acquire data. Changing them between data acquisition and making a measurement can lead to incorrect values being recorded.

# APPARATUS

* Sonometer with copper wire stretched over it
* 2 sharp wedges
* Step-down transformer
* Horseshoe magnet
* Meter scale
* Weights
* Ammeter

# Description Of Apparatus

1. ***Sonometer***

A Sonometer is **a device for demonstrating the relationship between the frequency of the sound produced by a plucked string**, and the tension, length and mass per unit length of the string.

1. ***Step-down transformer***

A Step Down Transformer is **the device designed to reduce the voltage from primary to secondary**. The transformation ratio of a transformer is equal to the square root of its primary to secondary inductance (L) ratio.

1. ***Horseshoe magnet***

Horseshoe magnets work **by attracting ferromagnetic materials from different surfaces**. A horseshoe magnet have two magnetic poles close together, so there is a more direct path for the flux lines, which makes the magnetic field concentrated between the two magnetic poles.

1. ***Ammeter***

An ammeter /ˈamɪtə/ (abbreviation of Ampere meter) is a **measuring instrument used to measure the current in a circuit**. Electric currents are measured in Amperes (A), hence the name. ... Instruments used to measure smaller currents, in the milliampere or microampere range, are designated as milliammeters or microammeters.

# Formula used

The frequency of the given ac supply which is equal to the frequency of the vibrating string is given by the formula.

F=

Where,

L= length of the sonometer wire between the two edges when it is thrown into resonant vibrations.

T= tension applied to wire

µ=mass per unit length of the wire.

For cuppor µ=0,0052gm/cm

***Diagram

Description automatically generatedCIRCUIT DIAGRAM***

***Procedure***

1. Connect the primary of the stepdown transformer to A.C mains, while the secondary to the two ends of the sonometer wire.
2. The horse shoe magnet is placed in the middle of the wire such that the magnet field is applied in horizontal plane and at right angles to the right of the wire.
3. Hang a mass M (say 250gm) from one end of the wire. Keep one wedge constant and move the other wedge with respect to the magnet till the wire appears to be vibrating with the maximum amplitude.
4. Note the distance l between two wedges by subtracting the length of the second wedge say l2 from the first wedge l1.
5. By increasing the tension on the wire, repeat the experiment for three or more different tensions/weights.
6. Take reading and increasing weights

***Observations and calculations***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S  NO | Mass,m  (gm) | T=mg  (cm) | L1  (cm) | L2  (cm) | L=l2-l1  (cm) | F= |
| 1. | 1000 | 1000×980 | 5 | 49 | 44 | 49.33 |
| 2. | 1250 | 1250×980 | 5 | 53 | 48 | 50.55 |
| 3. | 1500 | 1500×980 | 5 | 59.5 | 54.5 | 49.77 |
| 4. | 1750 | 1750×980 | 5 | 64 | 59 | 49.96 |
| 5. | 2000 | 2000×980 | 5 | 66.5 | 61.5 | 49.91 |

***GRAPH***

***![Chart, line chart

Description automatically generated]()***

***Precuations:***

1. Pulley should as frictionless as possible.
2. Horse shoe magnet should be placed in the middle.
3. Mass of the hanger should be included in tension.
4. Edges of the wedge should be sharp.
5. The distance between the two bridges should be altered very slowly otherwise resonance point would be missed.
6. After taking each of the observations, circuit should be switched off for a few minutes.