Birzeit University

Physics Department

Phys211

Experiment #7

**Sound Waves**

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**Abstract**

**The Aims of the experiment:**

* To generate the sound waves
* to find the speed of the waves in air
* to find the end correction

**The method used :**

by using a single generator (connected to a microphone to produce the audio signal) with different frequencies, and by raising & lowering the funnel to find L1 & L2 ( the height of air above the water surface in U-tube where the resonance occure).

**The main results :**

m/s

m

**Theory**

Resonance results from the formation of node at the closed end& an anti-node at the open end of a tube closed at one end.

The conditions for the 1st and 2nd resonances are:

|  |
| --- |
|  |

……..(1)

……(2)

end correction

**L**: the height of the air

from eqs 1 &2 :

(but  **, f :**frequency & : the speed of sound in air **)**

**Procedure**

We used the signal generator to give different frequencies. We started with frequency of approx. 350 Hz & recorded  **.** After that we changed the frequency up to approx 700 Hz to obtain for each.

were determined by raising and lowering the funnel until the sound be as loud as possible.

**Data**

|  |  |  |
| --- | --- | --- |
| Frequency (Hz) |  |  |
| 349.2 | 23.5 | 73.5 |
| 400 | 20.3 | 63.5 |
| 449.4 | 18.0 | 56.4 |
| 499.8 | 16.5 | 50.5 |
| 549.8 | 14.5 | 46.0 |
| 599.9 | 13.0 | 42.0 |
| 650.1 | 12.2 | 38.7 |
| 699.9 | 11.4 | 36.0 |

**Calculations**

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency (Hz) | 1/f | L1 (m) | L2 (m) |
| 349.2 | 0.002863688 | 0.235 | 0.735 |
| 400 | 0.0025 | 0.203 | 0.635 |
| 449.4 | 0.002225189 | 0.18 | 0.564 |
| 499.8 | 0.0020008 | 0.165 | 0.505 |
| 549.8 | 0.001818843 | 0.145 | 0.46 |
| 599.9 | 0.001666944 | 0.13 | 0.42 |
| 650.1 | 0.001538225 | 0.122 | 0.387 |
| 699.9 | 0.001428776 | 0.114 | 0.36 |

|  |  |  |
| --- | --- | --- |
|  | slope | y-int |
| value | 85.12528 | -0.00895 |
| error | 1.564742 | 0.003221 |

Since &

So 4\* Slope =

**= 340.5\*(6.258967 = 6**

Y-int = -e = -0.00895

e = 0.009 m

|  |  |  |
| --- | --- | --- |
|  | **slope** | **y-int** |
| **Value** | 260.4903 | -0.01411 |
| **Error** | 1.553559 | 0.003198 |

Slope =

**m/s**

Y-int = -e =-0.01411

e = 0.014 m

3 m/s

m/s

**0.003m**

m

**Conclusion**

m

m/s

The theoretical values are

**For**

**D =** 344 -343 **= 1 < 2\* (the value is acceptable)**

**For  *e***

D = 0.015 -0.012 = 0.003 < 2\*0.003 (the value is acceptable).

**There were many sources of error**

* the level of water can never be straight
* the frequency didn’t be constant all the time we note that is falls down slightly.
* The theoretical value of sound wave is taken to be at 20C not at the real room temperature.
* The reading of height was not very accurate.