**Experimental Report 6**

# DETERMINATION OF SOUND WAVELENGTH AND VELOCITY USING STANDING WAVE PHENOMENON

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#### I/ Experimental motivation

* Understand the physical phenomenon of standing waves.
* Determine the sound wavelength and propagation velocity.

#### II/ Experimental results

**Table 1**

| Frequency: 𝑓1 = 500 𝐻𝑧 | | | |
| --- | --- | --- | --- |
| Trials | 𝐿1(𝑚𝑚) | 𝐿2(𝑚𝑚) | 𝑑1 = 𝐿2 − 𝐿1(𝑚𝑚) |
| 1 | 164 | 509 | 345 |
| 2 | 163 | 508 | 345 |
| 3 | 165 | 508 | 343 |
| 4 | 164 | 510 | 346 |
| 5 | 163 | 509 | 346 |
| Average |  |  | = 345.0 |

**Table 2**

| Frequency: 𝑓2 = 600 𝐻𝑧 | | | |
| --- | --- | --- | --- |
| Trials | 𝐿1(𝑚𝑚) | 𝐿2(𝑚𝑚) | 𝑑2 = 𝐿2 − 𝐿1(𝑚𝑚) |
| 1 | 135 | 423 | 288 |
| 2 | 135 | 424 | 289 |
| 3 | 136 | 425 | 288 |
| 4 | 136 | 425 | 289 |
| 5 | 135 | 424 | 289 |
| Average |  |  | = 288.6 |

**Table 3**

| Frequency: 𝑓3 = 700 𝐻𝑧 | | | |
| --- | --- | --- | --- |
| Trials | 𝐿1(𝑚𝑚) | 𝐿2(𝑚𝑚) | 𝑑3 = 𝐿2 − 𝐿1(𝑚𝑚) |
| 1 | 114 | 358 | 244 |
| 2 | 112 | 358 | 246 |
| 3 | 113 | 359 | 246 |
| 4 | 112 | 358 | 246 |
| 5 | 112 | 359 | 247 |
| Average |  |  | = 245.8 |

**III/ Data processing**

1. **Calculation of average value and absolute error of wavelength:**
   1. 𝒇𝟏 = 𝟓𝟎𝟎 𝑯𝒛***:***

Then: 𝜆1 = 690.00 ± 0.68 (mm) = ( ± 0.68) ×10-3 (m)

**Hence:**

| 𝜆1 = ( ± 0.68) ×10-3 (m) |
| --- |

* 1. 𝒇𝟐 = 𝟔𝟎𝟎 𝑯𝒛***:***

Then: 𝜆2 = ± 0.22 (mm) = (577.20 ± 0.22) ×10-3 (m)

**Hence:**

| 𝜆2 = (577.20 ± 0.22) ×10-3 (m) |
| --- |

* 1. 𝒇𝟑 = 𝟕𝟎𝟎 ***:***

Then: 𝜆3 = 0 ± 0.88 (mm) = (491.60 ± 0.88) ×10-3 (m)

**Hence:**

| 𝜆3 = (491.60 ± 0.88) ×10-3 (m) |
| --- |

1. **Calculation of average value and absolute error of sound velocity:**
   1. 𝒇𝟏 = 𝟓𝟎𝟎 𝑯𝒛

Then:

**Hence:**

|  |
| --- |

* 1. 𝒇𝟐 = 𝟔𝟎𝟎 𝑯𝒛

Then:

**Hence:**

|  |
| --- |

* 1. 𝒇3 = 7𝟎𝟎 𝑯𝒛

Then:

**Hence:**

|  |
| --- |

1. **Theoretical velocity of sound wave and experimental values:**

Theoretically, the velocity of sound wave at a temperature T can be calculated as follows:

At room temperature T = 200C:

In direct comparison with v1, v2, v3 which are measured above, we can conclude that our experiment values are acceptable since they approximate the theoretical value.