**Class\_\_\_\_\_\_ Student ID\_\_\_\_\_\_\_\_\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pre-class Assignment Grade\_\_\_\_\_\_\_\_\_\_\_ Final Grade\_\_\_\_\_\_\_\_\_\_**

**Experiment：Measurement of the Speed of Sound in Air**

**Ⅰ. Pre-Lab Preparation**

For experimental data obtained via the standing-wave method and the phase-comparison method, how would you evaluate the wavelength of sound via the method of successive differences?

**II. Original Data**

Standing-wave Method，temperature *t* =\_\_\_\_\_oC，frequency *f* =\_\_\_\_\_kHz

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Data set | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Position  *xi* (mm) |  |  |  |  |  |  |  |  |  |  |

Phase-comparison Method，temperature *t* =\_\_\_\_\_ oC，frequency *f* =\_\_\_\_\_kHz

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Data set | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Position  *xi* (mm) |  |  |  |  |  |  |  |  |  |  |

Time-difference Method，temperature *t* =\_\_\_\_\_ oC

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Data set | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Position  *xi* (mm) |  |  |  |  |  |  |  |  |  |  |
| Time  *ti* (μs) |  |  |  |  |  |  |  |  |  |  |

|  |  |
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| **教师** | **姓名** |
| **签字** |  |

**III. Data Processing**

1. For experimental data obtained via the standing-wave method and the phase-comparison method, evaluate the wavelength of sound via the method of successive differences, and then compute the speed of sound via the relation *v = f λ*.

2. For experimental data obtained via the time-difference method, evaluate the speed of sound via the method of linear regression.

3. Compute the theoretical value of the speed of sound, and the relative error in each method of measurement.

**IV. Discussion and Conclusions**

（Compare the results obtained from the three methods of measurement, and list the pros and cons of each method.）

**V. Questions**

1. For the standing-wave method, why does the oscilloscope display a sinusoidal waveform instead of a standing wave?

2. For the phase-comparison method, why is it more preferable to use straight lines instead of ellipses to identify particular phase differences between the electrical signals of Channel 1 and Channel 2?

3. For each method of measurement, what are the possible sources of errors?