

Speed of Sound

PES 2150 General Physics Lab I

Purpose of the experiment

- Measure how long it takes sound to travel down and back in a long tube.
- Determine the speed of sound.
- Compare the speed of sound in air to the accepted value.
- FYI

^{FYI} If you yelled for 8 years, 7 months and 6 days you would have produced enough sound energy to heat one cup of coffee.

Background

Sound

Compared to most objects, sound waves travel very fast. It is fast enough that measuring the speed of sound is a technical challenge. One method you could use would be to time an echo. For example, if you were in an open field with a large building a quarter of a kilometer away, you could start a stopwatch when a loud noise was made and stop it when you heard the echo. You could then calculate the speed of sound.

To use the same technique over short distances, you need a faster timing system, such as a computer. In this experiment you will use this technique with a Microphone connected to a computer to determine the speed of sound at room temperature. The Microphone will be placed next to the opening of a hollow tube:

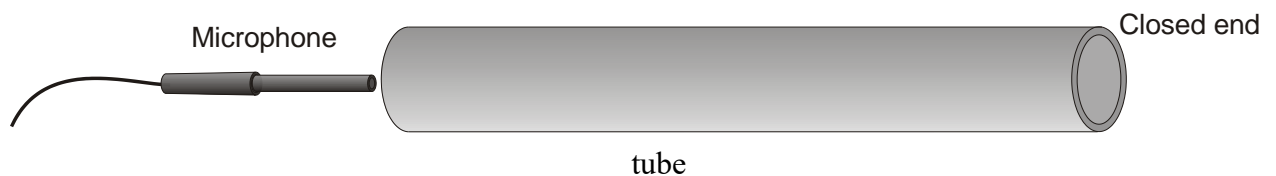


Figure 1: Apparatus for measuring the speed of sound.

When you make a sound by snapping your fingers next to the opening, the computer will begin collecting data. After the sound reflects off the opposite end of the tube, a graph will be displayed showing the initial sound and the echo. You will then be able to determine the round trip time and calculate the speed of sound.

Lab Procedure

- 1.) You will have noticed by now that we are trying something new with the lab this semester.
- 2.) Information has been compartmentalized in the hopes simplifying the process. Activities needed for each week have been separated into different sections:
 - i. Before Lab
 - Theory and background information on the physics, measurement techniques and equipment behind the current lab.
 - Prelab questions, to be completed and turned in before the beginning of the lab class.
 - ii. In Lab
 - Follow the procedure laid-out in the special Capstone file created for each lab.
 - Transfer all relevant data/graphs to the Data Sheet (Microsoft Word file) for use in your lab report.
 - iii. After Lab
 - Answer all questions and perform all needed analysis for you report.
 - Put all your information together into the Report (Microsoft Word file) and turn in before the beginning to the next lab meeting. You share data with your lab partner but every student should turn in a separate Lab Report.

