

DataVision Experiment: "Speed of Sound"

Subject: Physics

Sensor: Sound Wave

Overview:

This experiment will use the LogIT DataVision and two Sound Wave sensors to measure the speed of sound from one sensor to the other. The sound source will be a clap of the hands for simplicity. When the first sensor detects a reading from the hand clap, DataVision will Trigger and record the received sound to the second sensor. The difference in time between the first peaks of the two traces will be used to calculate the speed of sound.

Equipment required: DataVision CX
2 Sound Wave sensors
2 sensor extension cables
Hands to clap

Hazards:

If using a sound source other than hand claps, make sure the source does not exceed 90dB and that pupils are not too close.

Setup:

1. Connect the Sound Wave sensors to the sensor extension cables.
2. Plug the extension cables into channels 1 and 2 of DataVision.
3. Place the sensor from channel 1 at the end of a table as shown in the photo.
4. Place the sensor from channel 2 a set distance (1m is a good starting point) and in line with sensor 1.



Method:

1. Press a key to switch on DataVision
2. Using the joystick, select  'Setup Logging'
3. Select 'Periodic Logging' from the list
4. Leave Sensor 1 and 2 as 'Automatic' and Press 
5. Using the joystick and keypad, set the following:-

| | | |
|----------|--------------|---|
| Readings | [100 |] |
| Interval | [40 |] |
| Units | [microsecond |] |

6. Press 
7. Using the joystick and keypad, set the following:-

| | | |
|-------------|---------------|---|
| Trigger | [Channel 1 >] | |
| Value | [2000 mV |] |
| Pre-Trigger | [10% |] |

8. Press 
9. The DataVision will now wait for the Trigger. In this case a clap.
10. Stand in front of sensor 1 and clap your hands together.
11. DataVision will Trigger and display two plots on the single graph.

Speed of Sound Calculation:

Use the right joystick button to select the first peak from Channel 1 and note the time. Call this Time 1.

Use the right joystick button to then select the first peak from Channel 2 and note the time. Call this Time 2.

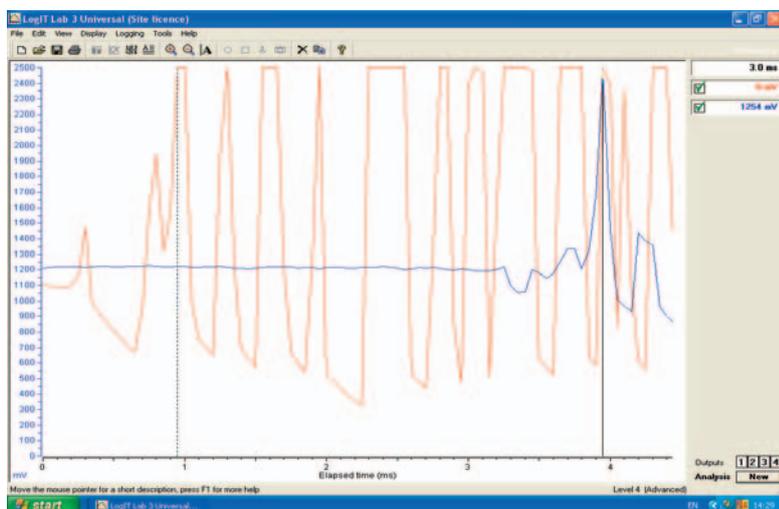
Note: To analyse the first peak of each trace, you may find it easier to remove the other trace by selecting the Sensor button on the keypad eg. to remove the second trace, simply press 

Calculate the time taken for the sound to travel from Sensor 1 to Sensor 2 by subtracting Time 1 from Time 2.

Then divide the Distance that the sensors were apart by the time taken.
(Remember to divide the time by 1000 to convert to seconds and leave the distance in metres)

Example:

The screen shot below is taken from LogIT Lab when the data was extracted from DataVision



Here the difference is 3.0ms

The distance was 1m

Hence the calculated speed of sound is 333m/s

Evaluation:

The Speed of Sound in air is approximately 340 m/s

If your results do not closely match this, remember that the Speed of Sound is dependant on Temperature and how moist the air is. The colder the room, the slower the Speed of Sound and vice versa.

For example, at 20 degrees and in dry air the speed of sound is about 343m/s.

Try doing a search on the Web for 'Speed of Sound and Temperature'