

Closed Tube Harmonics

Name _____ Date _____

Source Notes:

This lab was modeled after the "Speed of Sound" lab #30
"Laboratory Physics", Murphy Doyle, Merrill, 1990.
ISBN 0-675-02477-3

Jim Haine - Wissahickon High School, Ambler PA.
1997(?)
Modified 2010

Teacher Notes:

Modifications:

This experiment is still very similar to the original

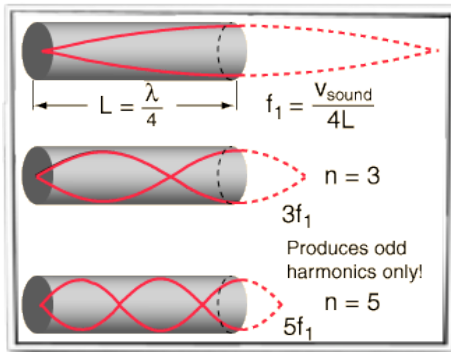
Grade

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Purpose:

To measure the speed of sound at room temperature.



Theory:

The length of the air column must be increased by four tenths of the diameter of the tube to correct for the small amount of air just outside the top of the tube that vibrates with the air column in the tube.

The velocity of a wave is equal to the product of its frequency and wavelength

In a closed tube, only odd harmonics are possible. The first standing wave has the basic properties of a single node and antinode pair.

Calculations:

$$v = f\lambda$$

Trial	Frequency (Hz)	Length of air column (cm)	Corrected Length (m)	Wavelength (m)	Speed (m/s)
1					
2					
3					
4					
$v_{\text{sound in air}} \approx 331.4 + 0.6T_c \text{ m/s}$				avg	
				actual	%

Conclusion (error analysis):

What was a possible source of error in this experiment?