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Physics Laboratory Report

Title 表題

Resonance in Pipe

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Summary

In this lab, we observed the area of resonance for 8 different tune forks, gathered our data and created a graph to compare our experimental data to the theoretical value. We learned the functions and mechanics of resonance and this was an easy, and exciting experiment!

追加／修正		

・締切り守って ・論理的に ・わかりやすく ・自分のことばで

1	2	3	4	5	6	7	8	9
Due 提出期限	Summary 要旨	Intro. 序	Exp. 実験	Results/Disc. 結果/考察	Table/Fig. 表/図	Concl./Opinion 結論/感想	Clearness わかりやすさ	Others 他
⑨				+	−	+		

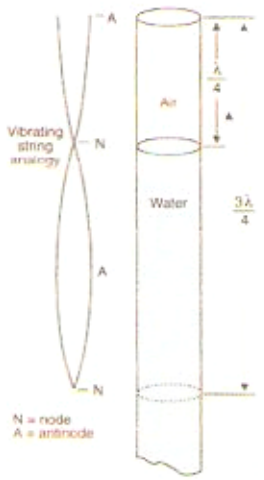
* レポートは、日本語あるいは英語で記載すること。 * この用紙をレポートの表紙として使うこと。
* 実験日から一週間目にあたる日までにレポートを提出すること。ただし、その後内容を付け加えて行っても良い。付け加えたときは、上に日付と内容を書くこと。

Takahiro Asai
Physics Lab Report #5
May 9th, 2013

Introduction

Objectives:

To find the area on the Water Column that matches with the frequency of the sound created by eight different Tune Folks



Theory:

Theoretical Values

Wave Length = V/F

Length of water Column A= λ /4 , B=3 λ /4

Wavelength λ exp = 2 (Bexp – Aexp)

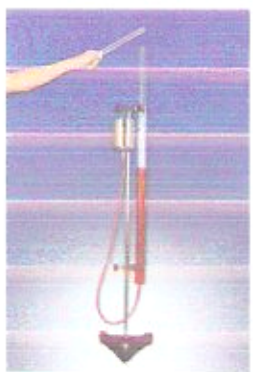
Speed of Sound V = f · λ exp

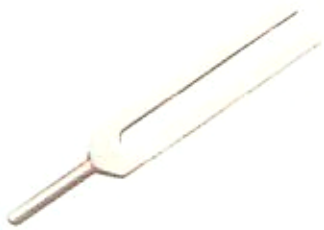
Location of Anti-node Δ A=Atheo – Aexp Δ B=Btheo – Bexp

Good summary but specify the meanings of symbols.

Experimental:

Materials





Air/water column with rubber tube and a cup

Tune Folks (8 Frequencies shown below)

Mallet

Thermometer

Methods

1). Find the temperature of the room, from the temperature derived calculate the speed of sound using the formula Vtheo= 331.5 + 0.6t

2) Prepare 8 different tune folks (Do, Si, La, So, Fa, Mi, Re, Do) and pick up Do (512Hz) and hit the fork with the mallet above the pipe. Adjust the water level starting from the top of the pipe and find the area where the sound is in the status of resonance. There are two areas of resonance in the pipe, mark each area as A and B.

3) Repeat this step for seven other folk pipes and record the experimental data for A and B. Calculate the λ exp by using the formula λ exp = 2 (Bexp – Aexp).
Also calculate Speed of Sound (Hz) by using the formula $V = f \cdot \lambda$ exp
Finally calculate Δ A and Δ B by formulae $\Delta A = A_{theo} - A_{exp}$ and $\Delta B = B_{theo} - B_{exp}$
Create a chart that involves all of the data above.

4) Gather all points of the speed of sound from Tune Folk 1 – 8 and create a graph from all the points.

Results

1) When I measured of the temperature of the room, it was 26.2 ℃. Therefore from the formula Vtheo= 331.5 + 0.6t we can calculate that the speed if the sound theoretically will be 347.22m/s.

2). & 3). The below table is the result of resonance in eight different types of tune folks.

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Table: Resonance in 8 different Tune Folks

		Tune Folk	Theoretical Value (theo)			Experimental Value (exp)					
		Frequncy f (Hz)	λ theo (m)	A theo (m)	B theo (m)	A exp (m)	B exp (m)	λ exp (m)	Speed of Sound (Hz)	Δ A	Δ B
1	Do	512	0.678	0.169	0.51	0.15	0.50	0.70	358.4	0.02	0.01
2	Si	480	0.723	0.181	0.542	0.17	0.535	0.73	350.4	0.01	0.007
3	Ra	426.7	0.814	0.204	0.611	0.195	0.60	0.81	345.6	0.004	0.011
4	So	384	0.904	0.226	0.678	0.215	0.662	0.894	343.3	0.011	0.016
5	Fa	341.3	1.017	0.254	0.763	0..243	0.748	1.01	344.7	0.11	0.015
6	Mi	320	1.085	0.271	0.814	0.260	0.801	1.082	346.24	0.011	0.013
7	Re	288	1.206	0.302	0.905	0.289	0.899	1.218	348.48	0.02	0.01
8	Do	256	1.356	0.339	1.017	0.329	0.989	1.32	337.92	0.01	0.028

* Do not wrap.

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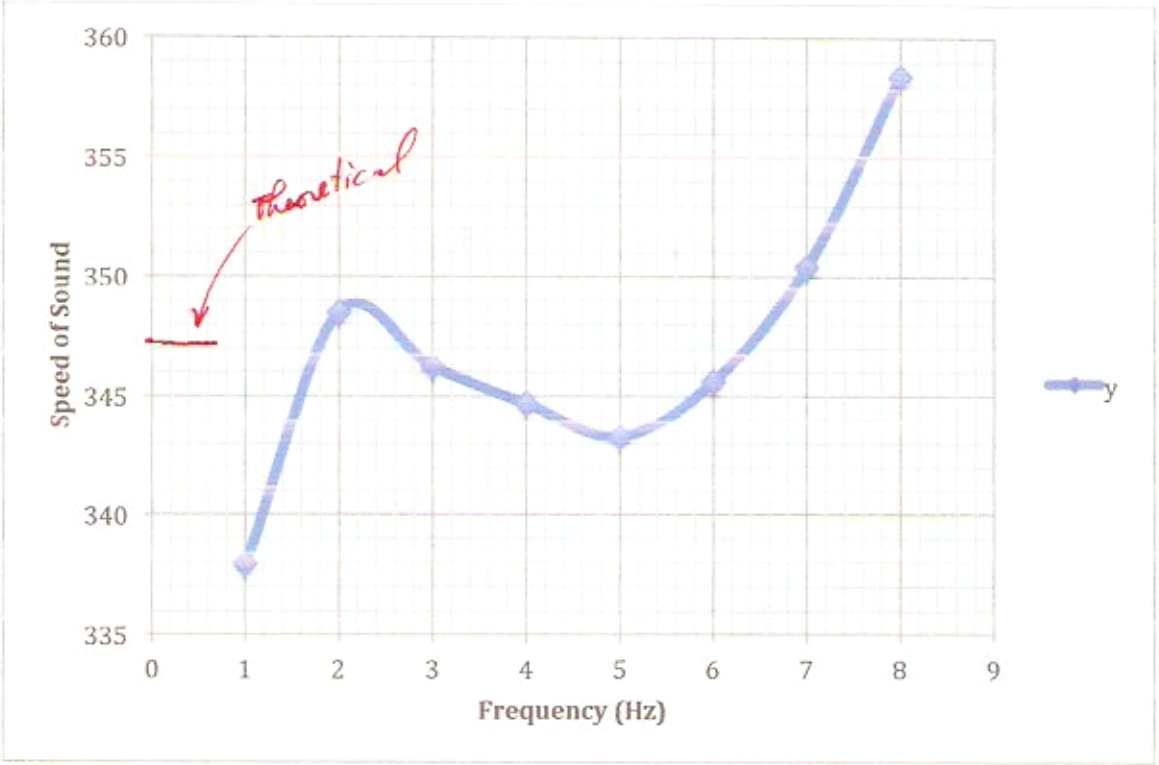
4). Below is the graph created by connecting points of speed of sound



Discussion

From the data we can observe that the experimental values were very close to the theoretical values that we calculated before the experiment. This means that the area of resonance we decided was very close to the theoretical area of resonance. We can see a trend that all experimental values were lower than the theoretical value since ΔA and ΔB became all positive numbers. Because this is the trend for all 8 tune folks this might suggest a common error that there might have been a slight mistake in the amount of water we put in or the way we measured the pipe. When we take a look at the graph we see that the point start from the bottom, goes up stays and goes up again. If all the values became the same as theoretical value, this graph should look like a straight line at the point 347.22m/s..

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Conclusion:

In this experiment we have observe the areas of resonance for 8 different tune folks and, gathered all our data to create a single chart and a graph. The results show that our experiment was quite accurate but there was slight error involved in each and every one of the experiments. The errors probably came from several reasons. First reason is the amount of trial that we took during the experiment. Throughout the experiment we only took one trial each for the measurement. We should have checked the measurement two or three times to gain a more precise data. When measuring the height of the water, you had to be extremely careful because the water easily goes up and down. That's is another area that we were not too careful about. In addition, the condition of the experiment was not so well. There were about 6 other groups doing the same experiment at the same time, making it extremely difficult to hear your own experiment.

Impression:

Compared to other labs that we had done before, this lab seemed very easy. All we had to do was to find the area of resonance using tune folks. We are glad that our data were pretty much accurate and precise and the results turned out to be very close to the theoretical value. From this experiment, we have learned the general trend of where each tune folk reach its resonance. Starting from Do (512Hz) the area of resonance A is very high in the pipe and as the frequency gets lower and lower the point of resonance also gets lower. Because this was such an easy experiment it was very easy to understand the concept of resonance and how it is really used in the real world.

Nice report and beautiful English.