Waleed Salem

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Lab 6: The Oscilloscope

Section: 04

Time: Tuesday 6pm-10pm

1. Objective

The aim of the experiment is to measure the speed of sound using an oscilloscope. The speed of sound in standard air pressure and temperature is 34000 cm/s, with an oscilloscope you can measure the period and frequency of a pitch or sound. This assists the user with measuring the speed of sound.

1. Procedure

The experiment is performed using an oscilloscope, a microphone, a meter stick, a speaker, and a signal generator. The microphone and signal generator need to be connected to the oscilloscope and the speaker needs to connected to the signal generator. With all the machines plugged into a power source and turned on you can conduct the experiment. On the signal generator set the amplitude at half of max and the waveform to produce square waves at 50Hz. The next step is to place the meter stick perpendicular to the speaker facing the direction of the sound, then place the microphone at the 0cm tick mark.

Set T\_1 on the oscilloscope to the largest spike on the left of the screen and record ∆T. Increment the microphone by 10cm and continue recording ∆T for every 10cm increment. At the specific values of 20cm, 40cm, 60cm, and 80cm record the V\_rms on the oscilloscope. Your last recording of the time delay will be at the 100cm mark.

1. Results



The speed of sound is found by taking the slope of the line generated by setting the distance of the microphone from the speaker as a function of time. The speed of sound found through the experiment was 32189 cm/s. The uncertainty value is ±33cm/s, the standard speed of sound in air at standard temperature and pressure is 34000 cm/s. The percent discrepancy between the theoretical and experimental speeds of sound is 5.3265%.

1. Discussion

The value of 32189 cm/s is very close to the standard speed of sound, I expected to the values to be very close but not to be exactly the same. I knew that the standard speed of sound is taken at sea level where the air pressure is roughly equal to 1 atmosphere(atm) and I knew that the city of San Bernardino is at a higher altitude then sea level so the speed of sound should differ. The uncertainty was ±33cm/s which was determined using the standard uncertainty for a function, since I let f(t)=L which means let the function f of t be the distance between the speaker and the microphone.

The values differ due to many factors; one cause is human error, for example when placing the microphone in the centimeter tick intervals a human being is only as precise as they can be with the measuring instruments given. This error is caused due to the lab materials not being as precise as possible; a meter stick was used in the experiment which is only accurate to .1cm. To circumvent this error a laser hooked up to a computer in a state of the art facility would be able to obtain more accurate results than the results obtained through this experiment.

Random errors are due to the temperature and air pressure of the room, there is no definite way to find the air pressure and temperature of the room or set the quantities to be constant. These values can randomly change and may cause errors in values. The speed of sound at standard air pressure and temperature is 34000 cm/s. In a more state of the art laboratory there would be ways to obtain the necessary information and the change it if needed for more accurate results. I expect the V\_rms, which is the root mean square voltage of the note, to be related to the experiment due to the waveform of the signal. I believe that the V\_rms measures the voltage of the wave generated by the signal.