

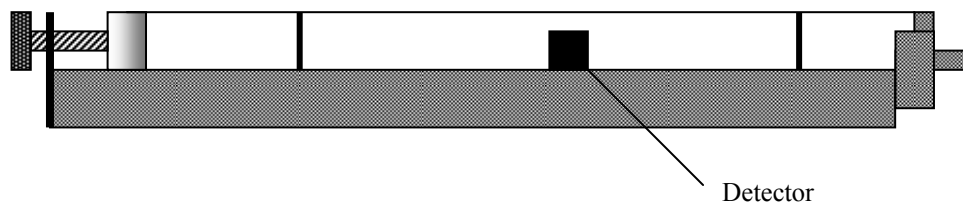
Practical 14 Vibration of a stretched string

Introduction

In this practical you will investigate the modes of vibration of a stretched string using the Fast Fourier Transform (FFT) option on the Pasco Interface. Any wave pattern can be made by superposing a series of simple sine waves of different frequency, wavelength and velocity. A Fourier transform is a mathematical method for calculating the components of a wave. The result of the transform are displayed on a bar chart showing the amplitude of the waves within a given frequency range. This is called a frequency spectrum.

Free Vibration

- ◆ Set up the detector underneath the sonometer string near the centre of the string as shown in the diagram. Connect the detector to the computer via the interface.
- ◆ In Data Studio drag the analogue sensor onto channel 1 and select voltage sensor.
- ◆ Select FFT from the display options
- ◆ You are now ready to carry out the investigation
- ◆ Pluck the string and record the output of the detector for a short period of time. Observe the frequency spectrum.
- ◆ You may have to adjust the settings to obtain a good result.



The highest amplitude wave is called the fundamental; any other waves present are harmonics. Given that the Frequency of the fundamental is given by the equation

$$f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$$

Where

T = The tension in the string

l = length of string

μ = Mass per unit length

Devise a method to find the mass per unit length of the string