Stationary waves on a stretched cord

Transcript

If a string is plucked and allowed to vibrate freely, there are certain frequencies at which it will vibrate. Stationary wave patterns are produced along vibrating strings when the waves reflect between fixed points.

A bench pulley is fixed to the desk.

The vibrator is connected to a signal generator. It is placed in the center of the desk so there is no risk of it falling.

One end of the cord is connected to the vibrator.

The other end of the cord is passed over the pulley and attached to a mass holder.

200 g is added to the mass holder to ensure the cord is taut.

The vibrator is placed 0.6 m from the pulley.

The signal generator is turned on and the frequency is set to the minimum.

As the frequency is increased the cord begins to vibrate.

The frequency is gradually increased until a stable stationary wave is produced.

This is the fundamental mode of vibration of the cord, or the first harmonic.

In this example the fundamental frequency is 18.8Hz.

The length of the cord is half a wavelength. The length is therefore doubled to find the wavelength.

In this example it is 1.2 m.

The frequency is gradually increased until a second stationary wave is formed.

This is the second harmonic.

The frequency is double that of the first harmonic.

This stationary wave has one node and the wavelength is equal to the length of the cord.

In this example the wavelength is 0.6 m.

The frequency is increased to find the third harmonic.

The wavelength of the third harmonic is equal to two thirds of the distance from the vibrator to the pulley.

The frequency is three times that of the first harmonic.

The frequency can be increased to find further harmonics.

This experiment has demonstrated stationary waves using stretched cords. The frequency of harmonics was shown to be related to the fundamental frequency of the cord. The relationship between wavelength and cord length was also investigated.