

①

Standing Waves

- A waveform that appears as though it is not moving.

On a string the pattern could look like this:



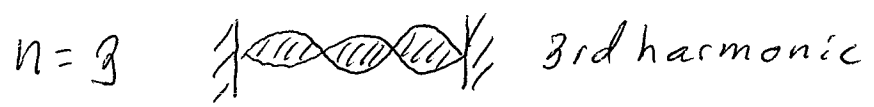
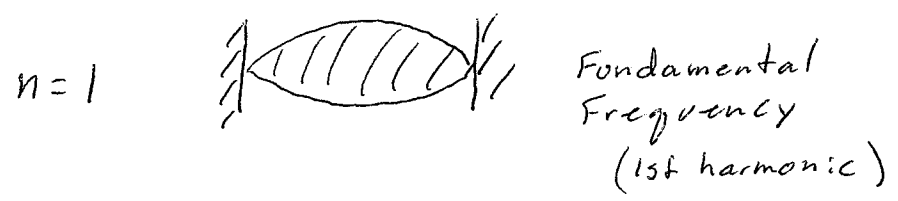
Standing waves occur when the material transporting the wave has a fundamental resonant frequency that matches the wave frequency.

* This resonant frequency is sometimes referred to as natural frequency

String Standing Waves

- A string that can be considered fixed at both ends can have many different standing wave patterns.
- Resonant conditions for a string with fixed ends require a node at each end.

↓
(minimum medium movement)



* The smallest portion of a wave that fits this condition is $\frac{1}{2}\lambda$

* notice too that any integer multiple of $\frac{1}{2}\lambda$ will also produce a wave pattern.

For a string of fixed length L

$$n \frac{\lambda_n}{2} = L$$

describes all wavelengths (λ_n) that will produce standing wave patterns

$$\lambda_n = \frac{2L}{n}$$

L = string length (m)

n = harmonic #

λ_n = wavelength of n th harmonic