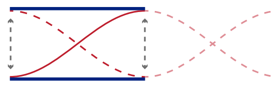
Cylinders

Open Cylinder



Fundamental frequency: $f_1 = \frac{v_S}{2L}$

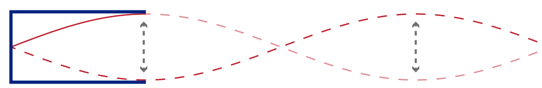
f_1 - Frequency of fundamental; v_S - Speed of sound (343 m/s); L - Length of cylinder

Fundamental wavelength: $\lambda = 2L$

λ - wavelength; L - Length of cylinder

- Has antinodes at both ends
- Can produce all harmonics

Closed Cylinder



Fundamental frequency: $f_1 = \frac{v_S}{4L}$

f_1 - Frequency of fundamental; v_S - Speed of sound (343 m/s); L - Length of cylinder

Fundamental wavelength: $\lambda = 4L$

λ - wavelength; L - Length of cylinder

- Has an antinode at the open end; a node at the closed end.
- Can produce only odd-numbered harmonics

Harmonic f & λ

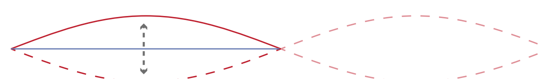
$f_n = nf_1$

$\lambda_n = \lambda_1 / n$

f_1 = fundamental frequency

λ_1 = fundamental wavelength

Vibrating String



Fundamental frequency: $f_1 = \frac{v_W}{2L}$

f_1 - Frequency of fundamental; v_W - Speed of wave on string; L - String length

Fundamental wavelength: $\lambda = 2L$

λ - wavelength; L - String length

Wave velocity, $v_W = \sqrt{\frac{TL}{m}}$

v_W - Speed of wave on string; T - String tension; L - String length; m - String mass

- Has an nodes both ends
- Can produce all harmonics
- Has a node at both ends.

Rev. 7/16/18