

Resonance

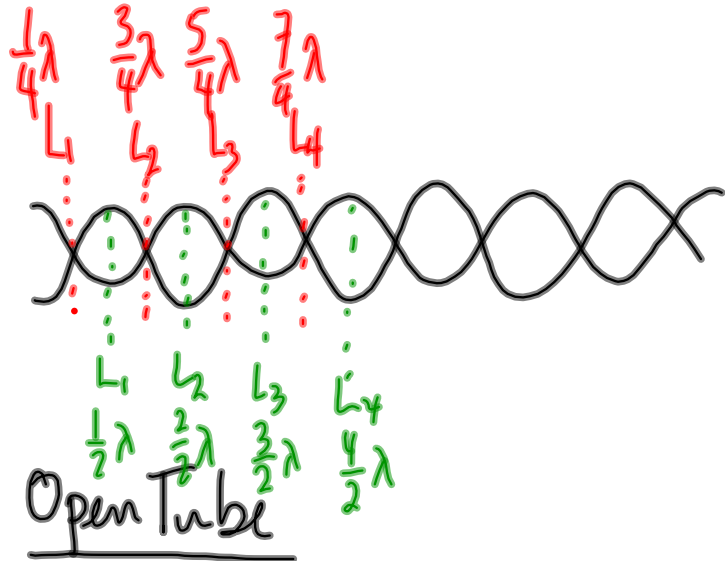
Closed Tube

- antinode at top
- node at bottom
- shortest tube is $\frac{1}{4}\lambda$
- spacing is $\frac{1}{2}\lambda$

$$L_n = (2n-1)\frac{\lambda}{4}$$

for a fixed length

$$f_n = (2n-1)f_1$$



Open Tube

- antinode at top + the bottom
- shortest tube is $\frac{1}{2}\lambda$
- spacing $\frac{1}{2}\lambda$

$$L_n = n\frac{\lambda}{2}$$

for a fixed length

$$f_n = nf_1$$

