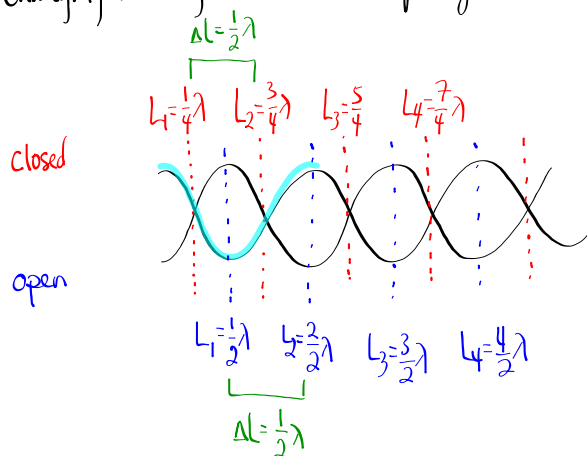


Resonance

Changing the length for a fixed frequency:



closed

shortest tube: $L_1 = \frac{1}{4}\lambda$

Spacing: $\Delta L = \frac{1}{2}\lambda$

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

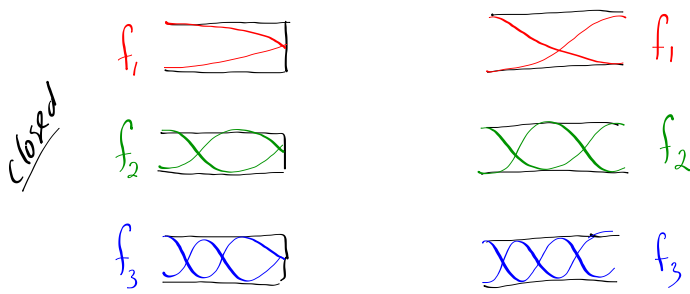
open

shortest tube: $L_1 = \frac{1}{2}\lambda$

Spacing: $\Delta L = \frac{1}{2}\lambda$

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

Changing the frequency for a fixed length:



$f_n = (2n-1)f_1$

$f_n = nf_1$

