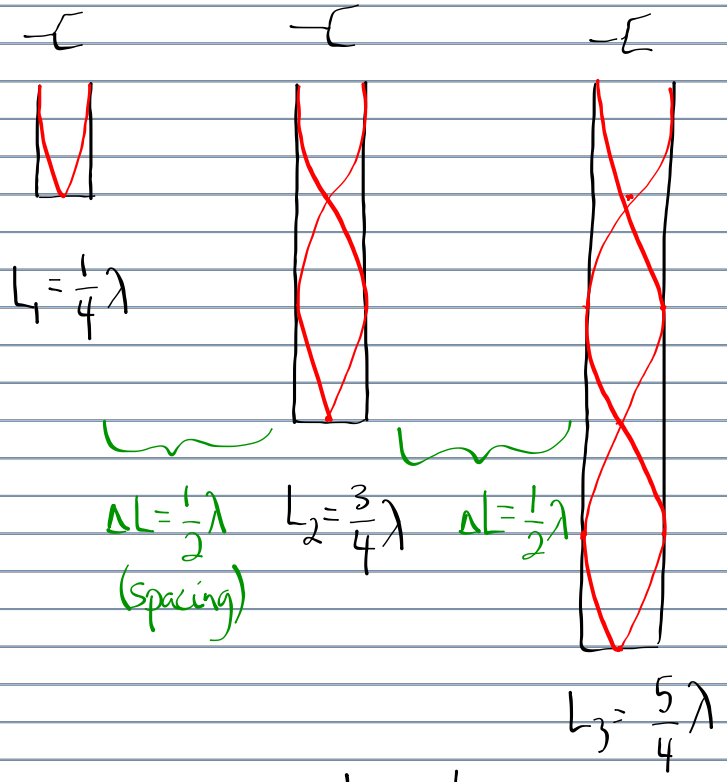
Closed Air Column Resonance



Shortest tube $\Rightarrow L_1 = \frac{1}{4}\lambda$

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

for the demo: $f = 1000\ Hz$

$\Delta L = 42 - 24\ cm = 18\ cm$

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

$18\ cm = \frac{1}{2}\lambda$

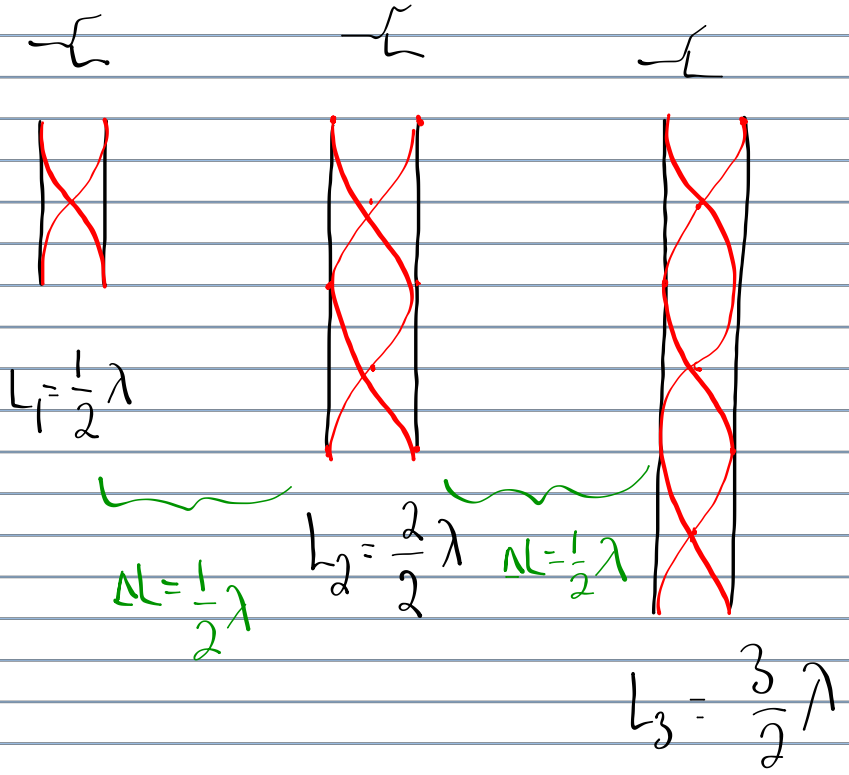
$\lambda = 36\ cm$

$v = \lambda f$

$v = (0.36\ m)(1000\ Hz)$

$v = 360\ m/s$

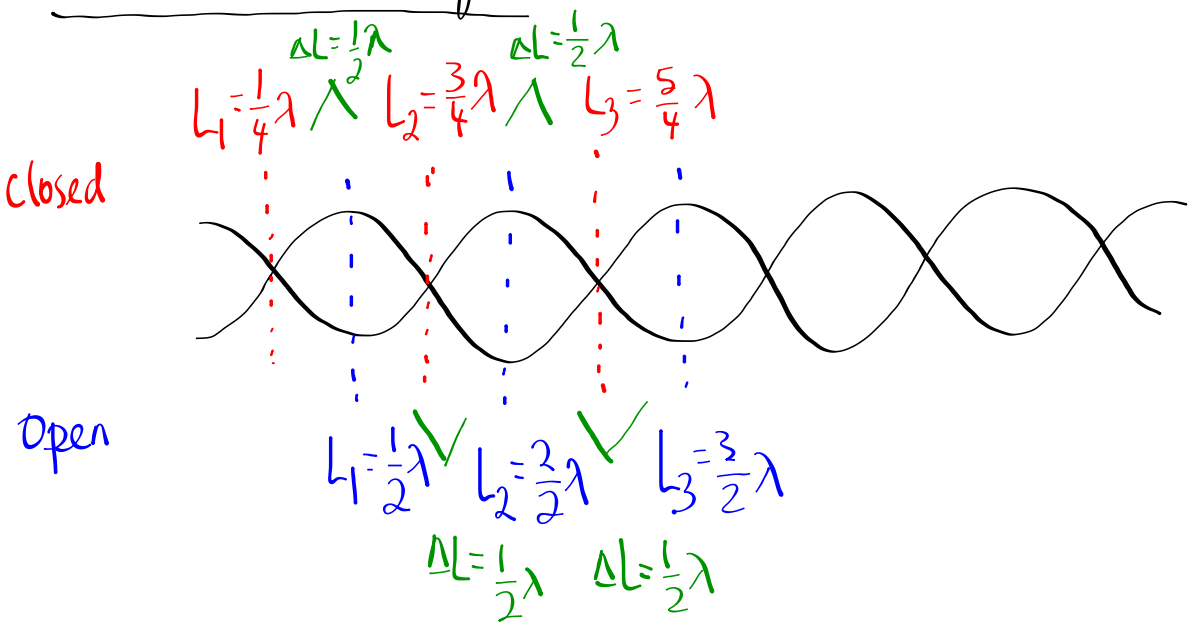
Open Air Column Resonance

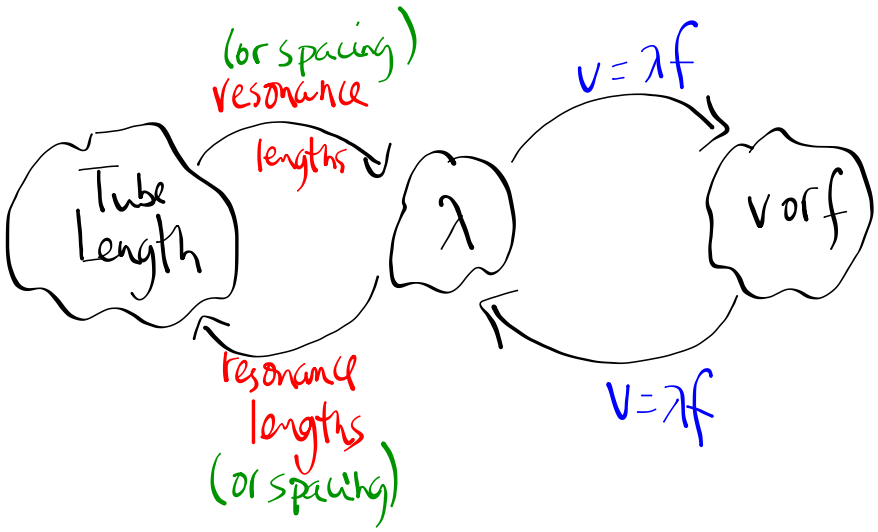


shortest tube $\Rightarrow L_1 = \frac{1}{2}\lambda$

spacing $\Rightarrow \Delta L = \frac{1}{2}\lambda$

Resonance Summary





mp|419

closed

$L_1 = 9.0\,cm$

$T = 20^\circ C$

$(v = 343\,m/s)$

a) $\lambda = ?$

b) L_2 and $L_3 = ?$

c) $f = ?$

$L_1 = \frac{1}{4}\lambda$

$9.0\,cm = \frac{1}{4}\lambda$

$\lambda = 36\,cm$

b) $L_2 = \frac{3}{4}\lambda$

$L_2 = \frac{3}{4}(36\,cm)$

$L_2 = 27\,cm$

$L_3 = \frac{5}{4}\lambda$

$L_3 = \frac{5}{4}(36\,cm)$

$L_3 = 45\,cm$

c) $v = \lambda f$

$f = \frac{v}{\lambda}$

$f = \frac{343\,m/s}{0.36\,m}$

$f = 9.5 \times 10^2\,Hz$

MP|425

$f_1 = 330Hz$

(open)

a) $f_2 = ?$

$f_3 = ?$

b) $L_1 = ?$

$(v = 344 m/s^2)$

a) $f_n = nf_1$

$f_2 = 2f_1$

$f_2 = 2(330Hz)$

$f_2 = 660Hz$

$f_3 = 3(330Hz)$

$f_3 = 990Hz$

b) $v = \lambda f$

$\lambda = \frac{v}{f}$

$\lambda = \frac{344 m/s}{330 Hz}$

$\lambda = 1.04 m$

$L_1 = \frac{1}{2}\lambda$

$L_1 = \frac{1}{2}(1.04m)$

$L_1 = 0.521m$

52.1m

TO DO

① Look at MP#2|425

② PP|421 + PP|427