Sound Intensity

$I_1 = P/4\pi r_1^2$

$I_1 4\pi r_1^2 = I_2 4\pi r_2^2$

$I_1/I_2 = r_2^2/r_1^2$

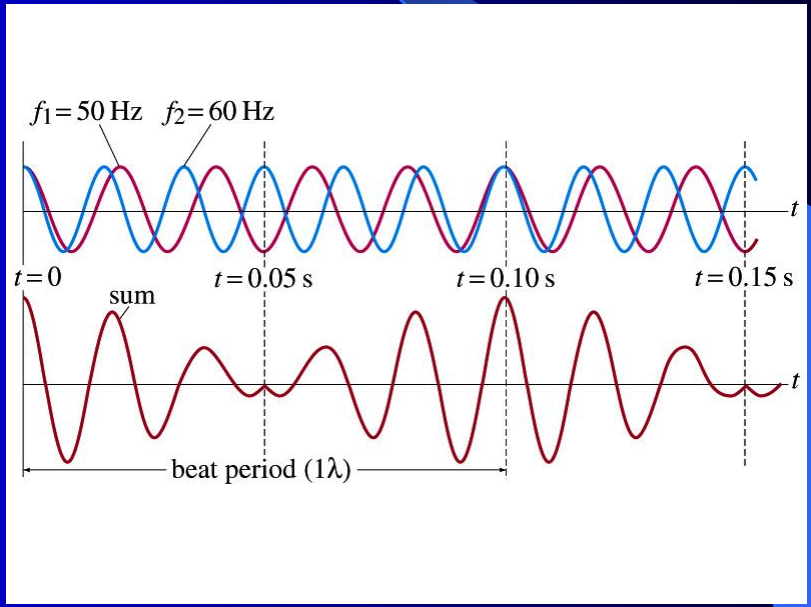
$\beta = (10\text{dB})\log I/I_0$

Beating of Waves

$T_{beat}=nT_1$, $T_{beat}=(n-1)T_2$

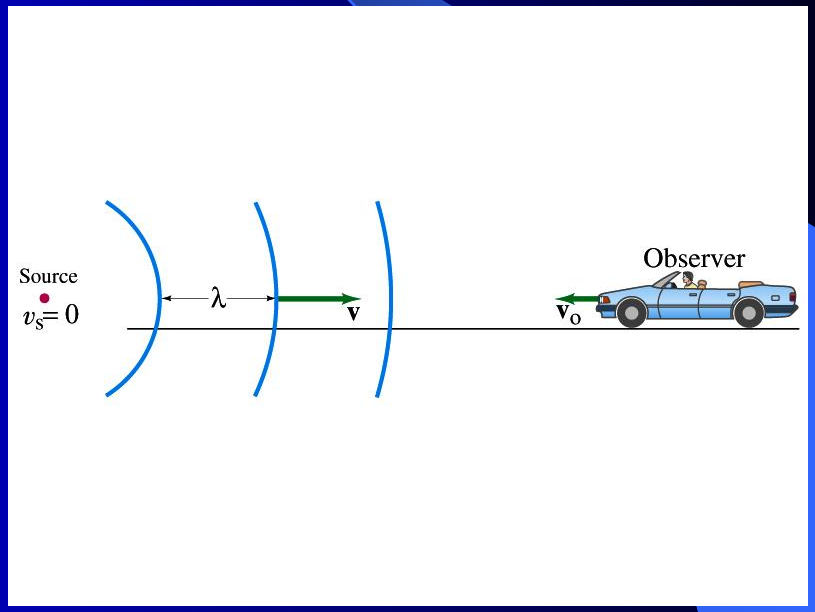
$T_{beat}=T_1T_2/(T_2-T_1)$

$f_{beat}=(T_2-T_1)/T_1T_2=1/T_1-1/T_2=f_1-f_2$



Doppler Effect

$f_L=(v+v_O)/\lambda=(v+v_O)/(v/f_S)$
$= f_S\,(v+v_O)/v$

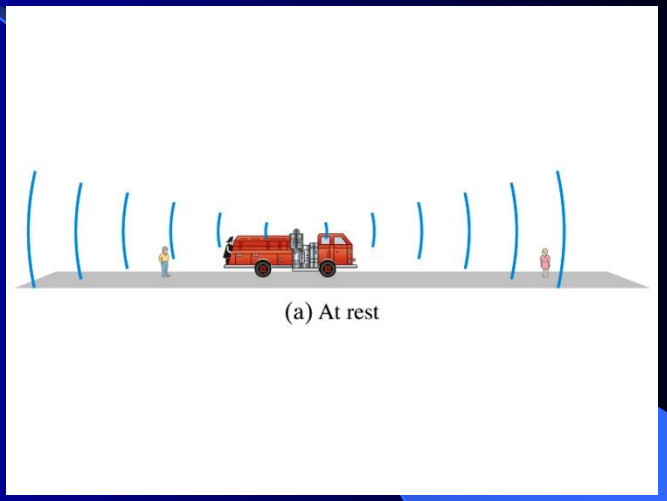


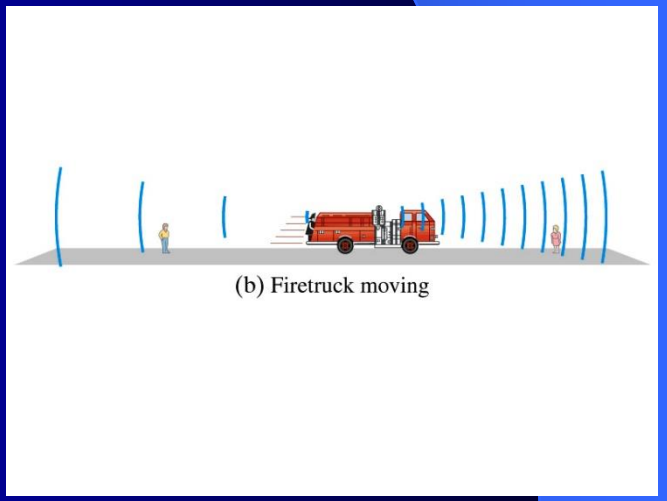
Doppler Effect

Right: $\lambda = v/f_S - v_S/f_S = (v-v_S)/f_S$

Left: $\lambda = v/f_S + v_S/f_S = (v+v_S)/f_S$

$f_L = (v+v_O)/\lambda = f_S\,(v+v_O)/(v+v_S)$





Supersonic Boom - Shockwaves