14.67   At 2.0 from localized source
you measure sound int. level 75 dB.
How far you walk away so that
perceived loudness "drops to half"
intensity is 65 dB

$I \propto \frac{1}{r^2}$ $\beta = 10 \log_{10} \left(\frac{I}{I_0} \right)$ $I_0 = 10^{-12} \frac{W}{m^2}$
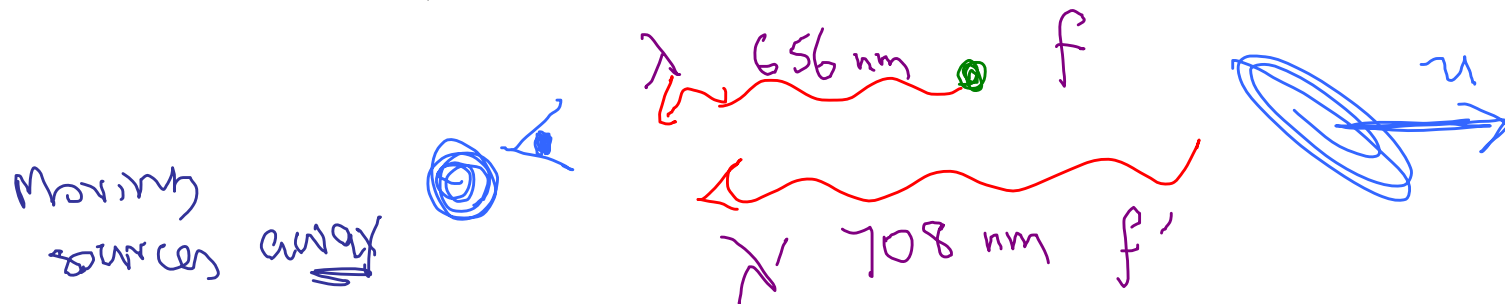
$$\beta_2 = 65 \, dB \qquad \beta_1 = 75 \, dB$$

$$\beta_2 - \beta_1 = 10 \left[\log_{10}\left(\frac{I_2}{I_0}\right) - \log_{10}\left(\frac{I_1}{I_0}\right) \right]$$

$$= 10 \left[\log_{10}\left(\frac{I_2}{I_1}\right) \right] = -10$$

$$\log_{10}\left(\frac{I_2}{I_1}\right) = -1 \qquad \frac{I_2}{I_1} = \frac{1}{10} = \frac{r_1^2}{r_2^2}$$

$$r_2^2 = 10 \, r_1^2 \qquad r_2 = \sqrt{10} \, r_1 \qquad r_1 = 2.0 \, m$$

$$r_2 = 6.2 \, m$$

14.47 Red light emitted by H atoms at rest has wavelength 656 nm Light emitted by galaxy receding has wavelength 708 nm. Find u velocity its moving at.

λ, 656 nm f

λ' 708 nm f'

Moving sources away

$$\lambda f = v = c$$

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

$$\frac{f'}{f} = \frac{1}{(1 + u/c)} = \frac{\lambda}{\lambda'}$$

u

$$\frac{1}{(1+u/c)} = \frac{\lambda}{\lambda'}$$

$$(1+\frac{u}{c}) = \frac{\lambda'}{\lambda} \qquad \frac{u}{c} = \frac{\lambda'}{\lambda} - 1 = \frac{708\,nm}{656\,nm} - 1$$

$$\frac{u}{c} = 0.0793 \qquad u = 2.37 \times 10^7 \frac{m}{s}$$

Units?

Units?