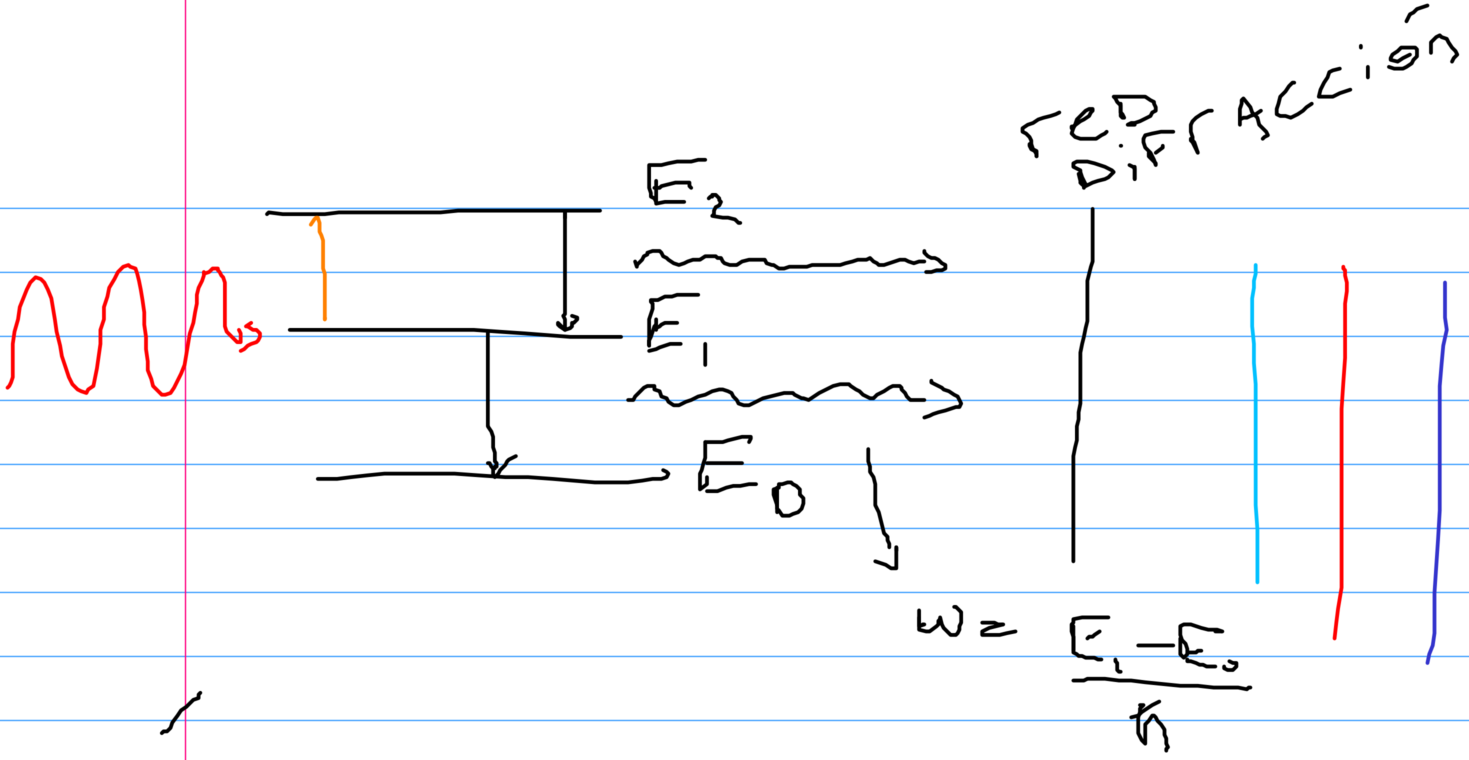


$$\omega_0 = \frac{E_1 - E_0}{\hbar}$$

$$\mathcal{E}(t) = A \cos(\omega_0 t) \Longrightarrow I(\omega) = A^2 \delta(\omega - \omega_0)$$

$$t < 0 \longrightarrow \mathcal{E}(t) = 0$$

N ÁTOMOS EXCITADOS

$$N_e(t + dt) = N_e(t) - A\, dt\, N$$

A: prob de emitir por unidad de tiempo

$$N_e(t) + \frac{dN_e}{dt} dt = N_e(t) - A\, dt\, N$$

$$\frac{dN_e}{dt} = -AN \Rightarrow N_e(t) = N e^{-At}$$

$$I(t) \propto \frac{dN_e}{dt} = -AN_e = -ANe^{-At}$$

$$I(t) = I_0 e^{-At}$$

$$\mathcal{E}(t) = A\cos\omega t \Rightarrow I \propto A^2$$

$\omega \gg A$

$$\mathcal{E}(t) = \mathcal{E}_0 e^{-\frac{At}{2}} \cos(\omega t)$$

$$\mathcal{E}(t) = \begin{cases} 0 & t < 0 \\ \mathcal{E}_0 e^{-\frac{At}{2}} \cos(\omega t) & \end{cases}$$

$$I(\omega) \propto \frac{1}{(\omega - \omega_0)^2 + \left(\frac{A}{2}\right)^2}$$

$$\Delta t \, \Delta\omega \sim \frac{1}{2}$$

$$\frac{1}{A} \Delta\omega \sim \frac{1}{2} \qquad \Delta\omega \sim \frac{A}{2}$$

Ensanchamiento Doppler

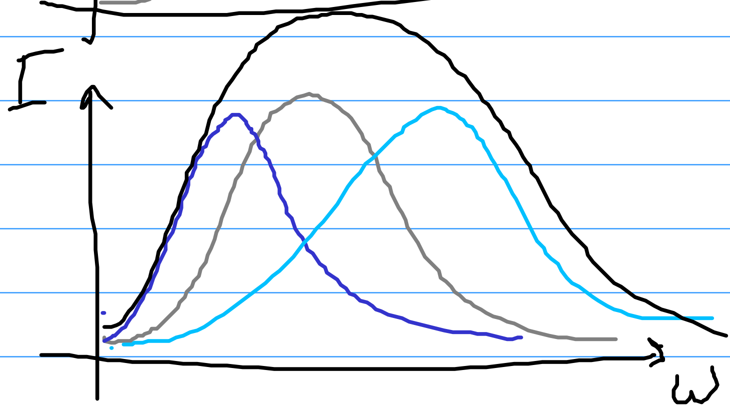
$$\frac{\partial^2 \mathcal{E}}{\partial t^2} = v \frac{\partial^2 \mathcal{E}}{\partial x^2} \Longrightarrow \omega_0 = v k$$

Átomo moviéndose $-V$

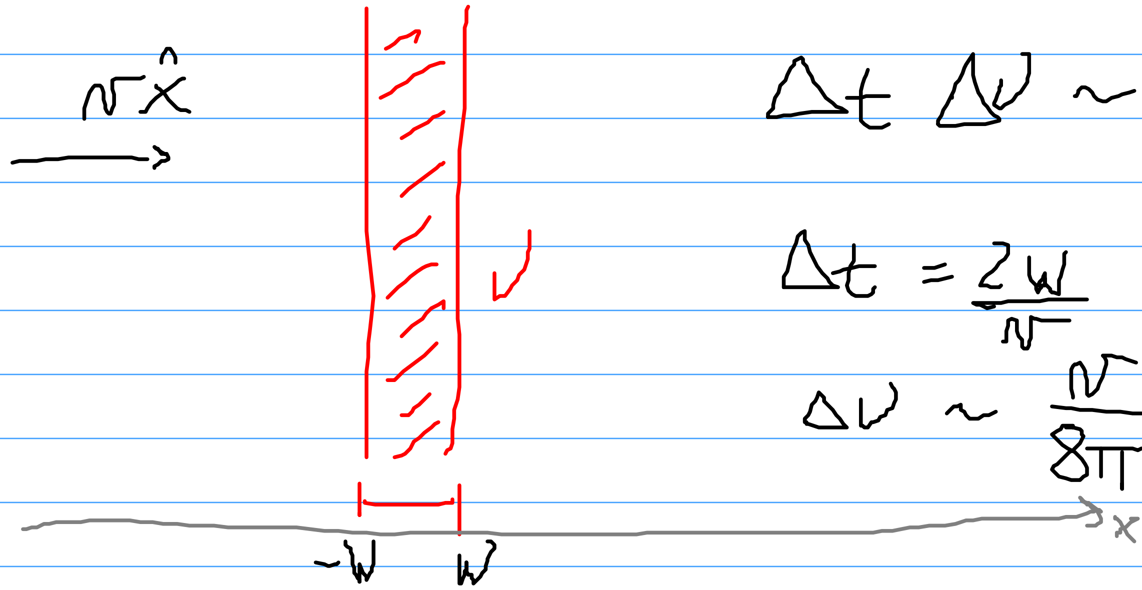
$v - V$ $\qquad \omega' = (v - V)\,k$

$$\boxed{\omega' = \omega_0 - Vk}$$

$$\omega' = \sqrt{\frac{1-\beta}{1+\beta}}\;\omega \qquad k = \frac{2\pi}{\lambda}$$



Tiempo de tránsito



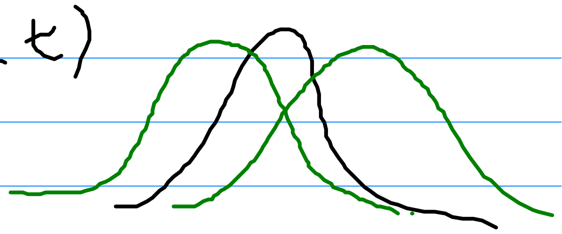
$$\Delta t \, \Delta \nu \sim \frac{1}{4\pi}$$

$$\Delta t = \frac{2W}{v}$$

$$\Delta \nu \sim \frac{v}{8\pi W}$$

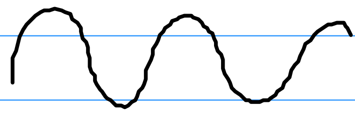
$$x(t) = X_0 \, \text{sen}(\Omega t)$$

$$v(t) = X_0 \Omega \cos(\Omega t)$$

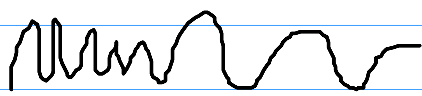


$$\omega' = \omega - Vk$$

$$\omega'(t) = \omega - k X_0 \Omega \cos(\Omega t)$$



$$\mathcal{E}(t) = \mathcal{E}_0 \cos(\phi(t))$$



$$\phi(t) = kx + \omega t$$

$$\phi = \int_0^t \omega(t)\, dt \qquad \frac{d\phi}{dt} = \omega \Rightarrow \phi(t) = \omega t - k X_0 \, \text{sen}\, \Omega t$$

$$\mathcal{E}(t) = \mathcal{E}_0 \cos(\omega t - k X_0 \, \text{sen}\, \Omega t)$$