


redshiftement par effet Doppler

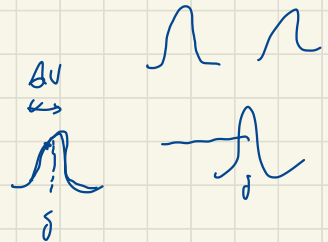
$$v_i = v_0 + \delta + \frac{v_a}{c} v_0$$

on obtient directement

$$\delta = \frac{v_a}{c} v_0 = \Delta v \quad \text{donc}$$

$$\sqrt{\langle v_a^2 \rangle} \frac{v_0}{c} \sim \Delta v$$

$$\frac{\sqrt{\hbar k_B T / m}}{c} \sim \frac{\Delta v}{v_0}$$



$$\hbar \delta \sim \hbar \Delta v \sim \hbar k_B T / m$$

$$\hbar \delta \sim p_z v_z \sim m v_z^2$$

$$dU = C_v dt$$