Effet photoéléctrique

Application de la règle d'or de Fermi !

$$\partial \mathcal{P}_{1S\to \mathbf{p}_f}(\mathbf{p}_f, t) = \frac{\pi t}{2\hbar}\int_{Df} \rho(E_f) \| \langle \mathbf{P}_f | \, W \, | \varphi_{1S} \rangle \|^2 \partial(E_f - E_i - \hbar\omega) \mathrm{d}E_f \mathrm{d}\Omega$$

$$W = -\frac{q}{(c)m} e^{i\mathbf{k}\cdot\mathbf{R}} \mathbf{A}_0 \cdot \mathbf{p}$$

$$kr \sim ka_0 \ll 1 \to \text{Approximation diploaire}$$

$$\langle \mathbf{p}_f | \, W \, | \varphi_{1S} \rangle = \int \mathrm{d}r^3 \frac{e^{i\mathbf{p}_f \cdot \mathbf{r}}}{(2\pi\hbar)^{3/2}} \langle \mathbf{r} | \, \mathbf{D} \cdot \mathbf{E} \, | \varphi_{1S} \rangle$$

$$\mathbf{r} \cdot \mathbf{E} = xE_X + yE_y + ZE_z = rE_0 \left(\cos\theta \cos\theta_0 + \sin\theta \sin\theta_0 \cos(\varphi - \varphi_0) \right)$$

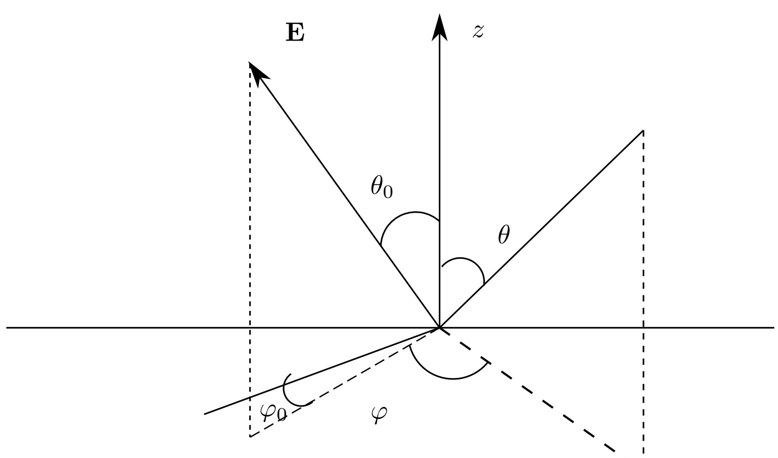

Figure 1 – Identification des vecteurs et angles

$$\langle \mathbf{p_f} W \, | \varphi_1 S \rangle | = -\frac{12qE_0}{\hbar^{2/3}\pi(2a_{0)}^{3/2}} \times \frac{15k_f a_0^5}{[1 + k_f^2 a_0^2]^3} \cos\theta_0$$

...

$$\boxed{\frac{\partial \mathcal{P}}{\partial t \partial \Omega_f} = \frac{256 a_0^3}{4\pi\hbar} \underbrace{\frac{E_0^2 q^2}{e^2}}_{E_0^2} \left(\frac{\omega}{\omega_0} - 1\right)^{3/2} \left(\frac{\omega}{\omega_0}\right)^6 \cos^2\theta_0}$$

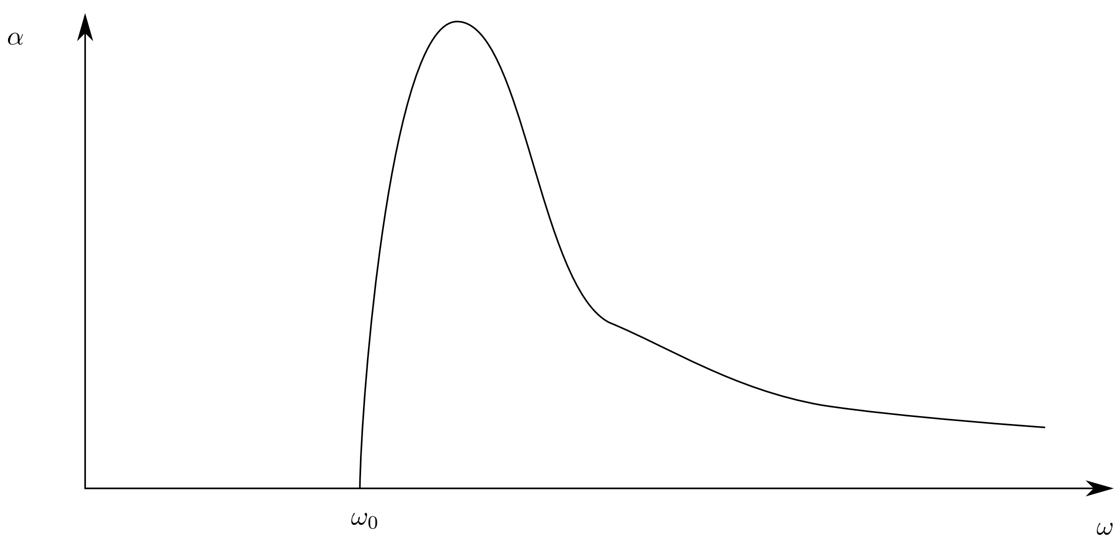

FIGURE 2 – Transition de l'effet photoéléctrique

On remarque que l'expression est imaginaire pour $\omega < \omega_0$

Théorie de la diffusion (élastique)

$$\mathrm{d}n \propto F_i \mathrm{d}\Omega$$

$$\mathrm{d}n = (\theta, \varphi) F_i \mathrm{d}\Omega$$

$$\sigma(\theta, \varphi) : \text{Section efficace de diffusion}$$

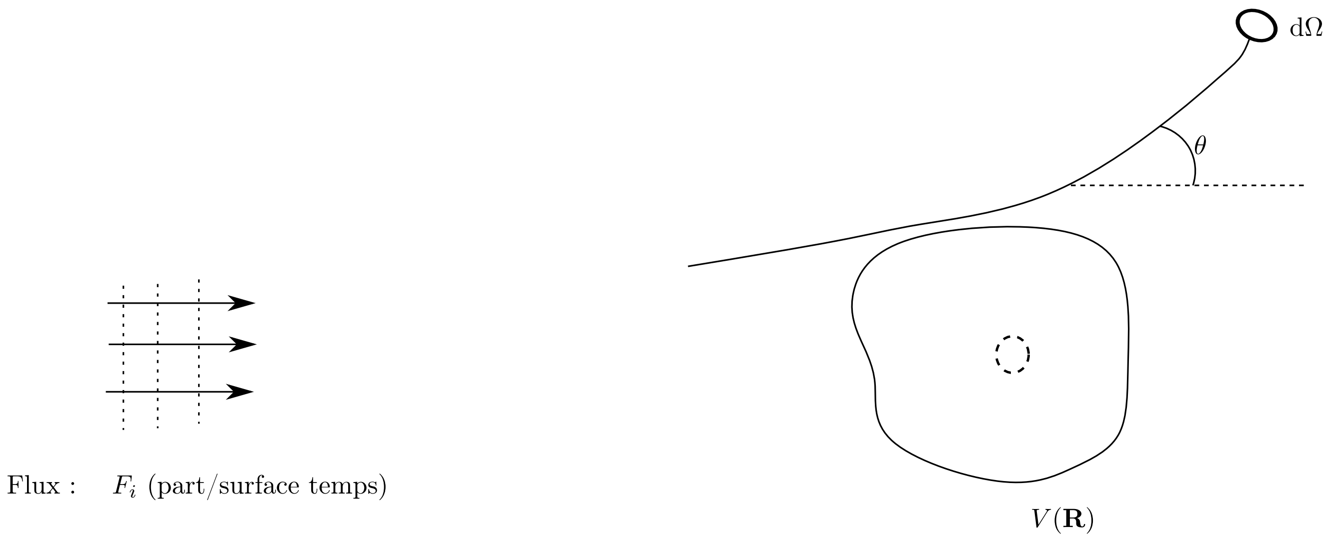

FIGURE 3 – Diffusion

[] = surface (barr = 10^{-24}cm^2

Considérations physiques

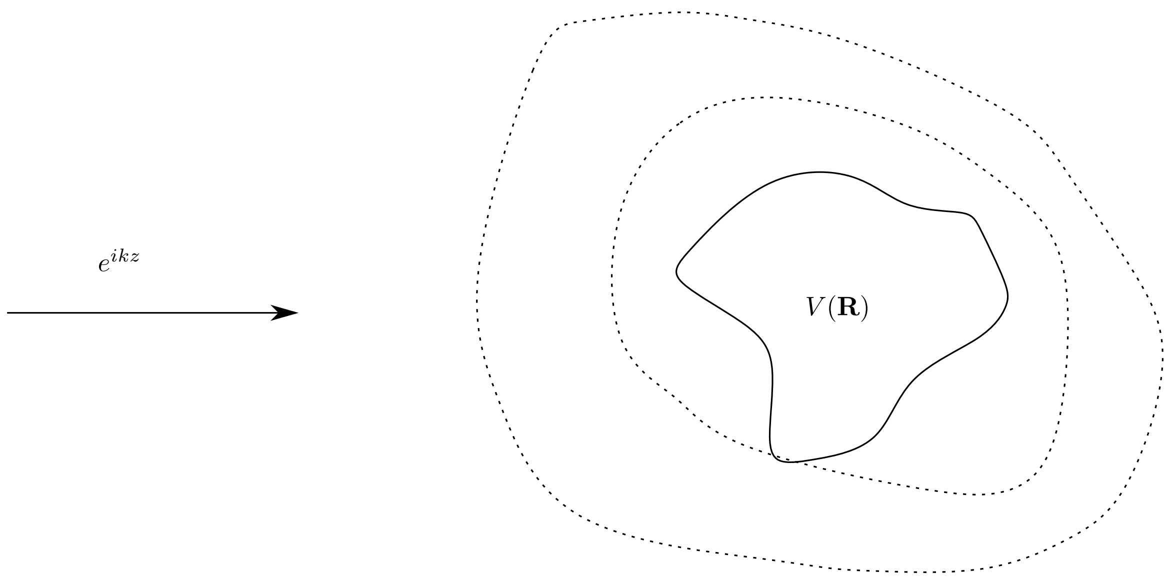

FIGURE 4 – Onde plane icidente