

PC2

$$\sin i = n \sin r \Rightarrow \cos i \circledast = n \cos r dr$$

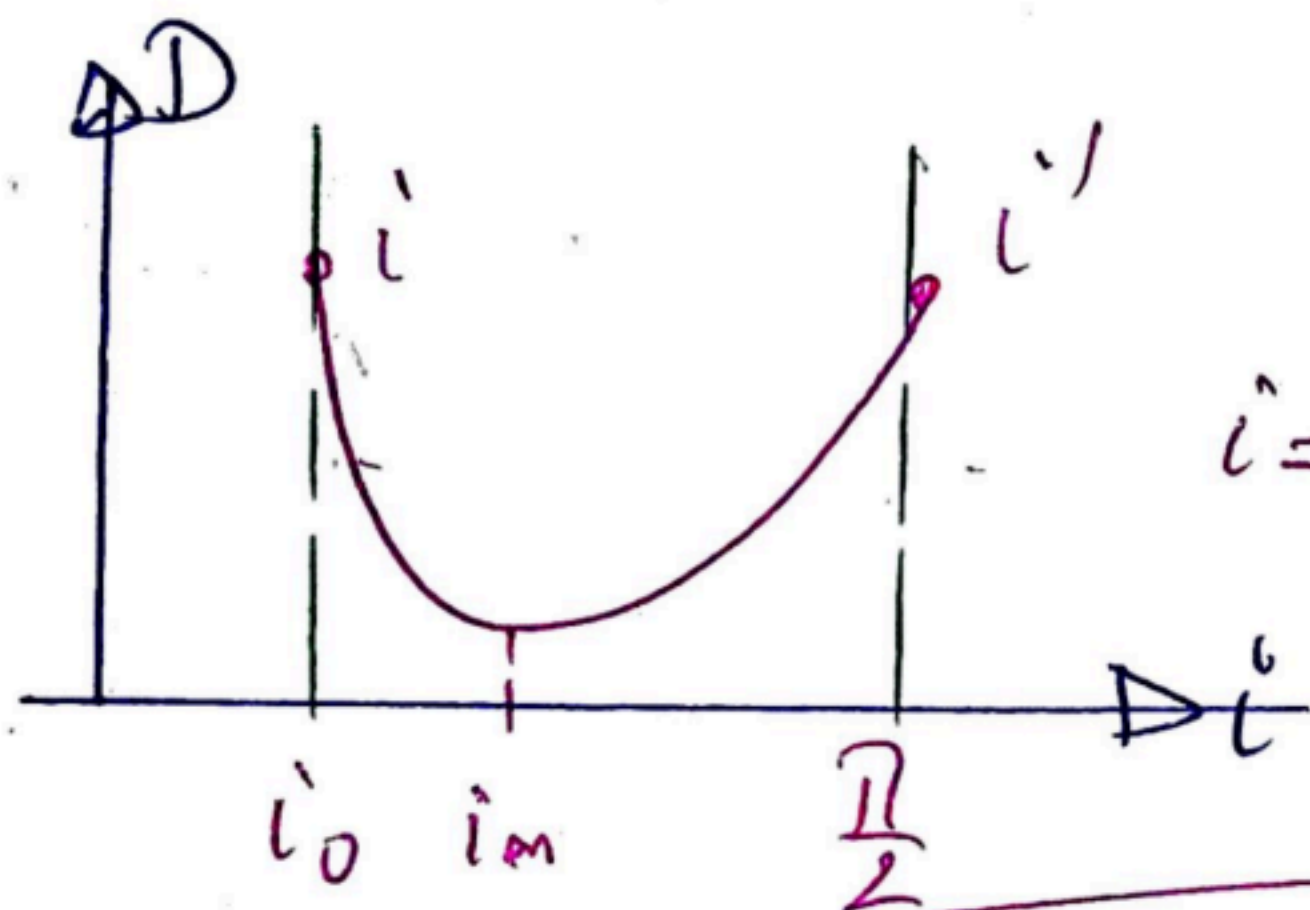
$$\sin i' = n \sin r' \Rightarrow \cos i' \circledast = n \cos r' dr'$$

$$A = r + r' \Rightarrow dA = 0 = dr + dr'$$

$$D = i + i' - A \Rightarrow dD = di + di'$$

$$\frac{dD}{di} = 1 + \frac{di'}{di}$$

Programme



$$i = i' = i_m$$

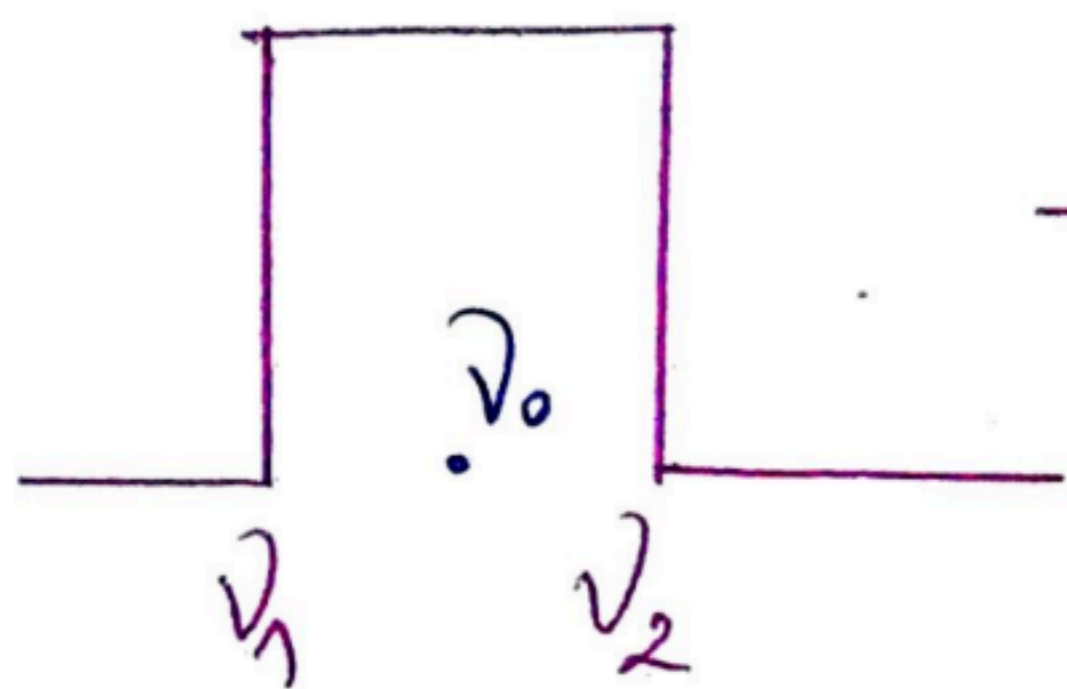
$$r = r' = r_m$$

$$D = D_m \Rightarrow n = \frac{\sin\left(\frac{A + D_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

adromatique

$$\left. \frac{\partial P}{\partial \lambda} \right|_{\lambda = \lambda_{ac}} = 0$$

$$S = \frac{ax}{D} - (n-1)e = p\lambda$$



$$\Rightarrow V(\delta) = \text{sinc}\left(\frac{\pi \delta \Delta \nu}{c}\right)$$

$$\nu = \frac{c}{\lambda} \Rightarrow d\nu = -\frac{c d\lambda}{\lambda^2}$$

$$\Delta \nu = +\frac{c}{\lambda_0^2} \Delta \lambda$$

$$\nu_0 = \frac{c}{\lambda_0}$$

$$V(\delta) = \text{sinc}\left(\frac{\pi \delta \Delta \lambda}{\lambda_0^2}\right)$$

$$V(\delta) = 0 \quad \text{1^{er} fois}$$

$$\delta = \frac{c}{\Delta \nu} = L_c$$

$$L_c = \frac{\lambda_0^2}{\Delta \lambda}$$

$$\cos\left(\frac{2\pi \delta}{\lambda}\right) = \cos\left(\frac{2\pi \delta \nu}{c}\right) = \cos(2\pi \delta \nu)$$

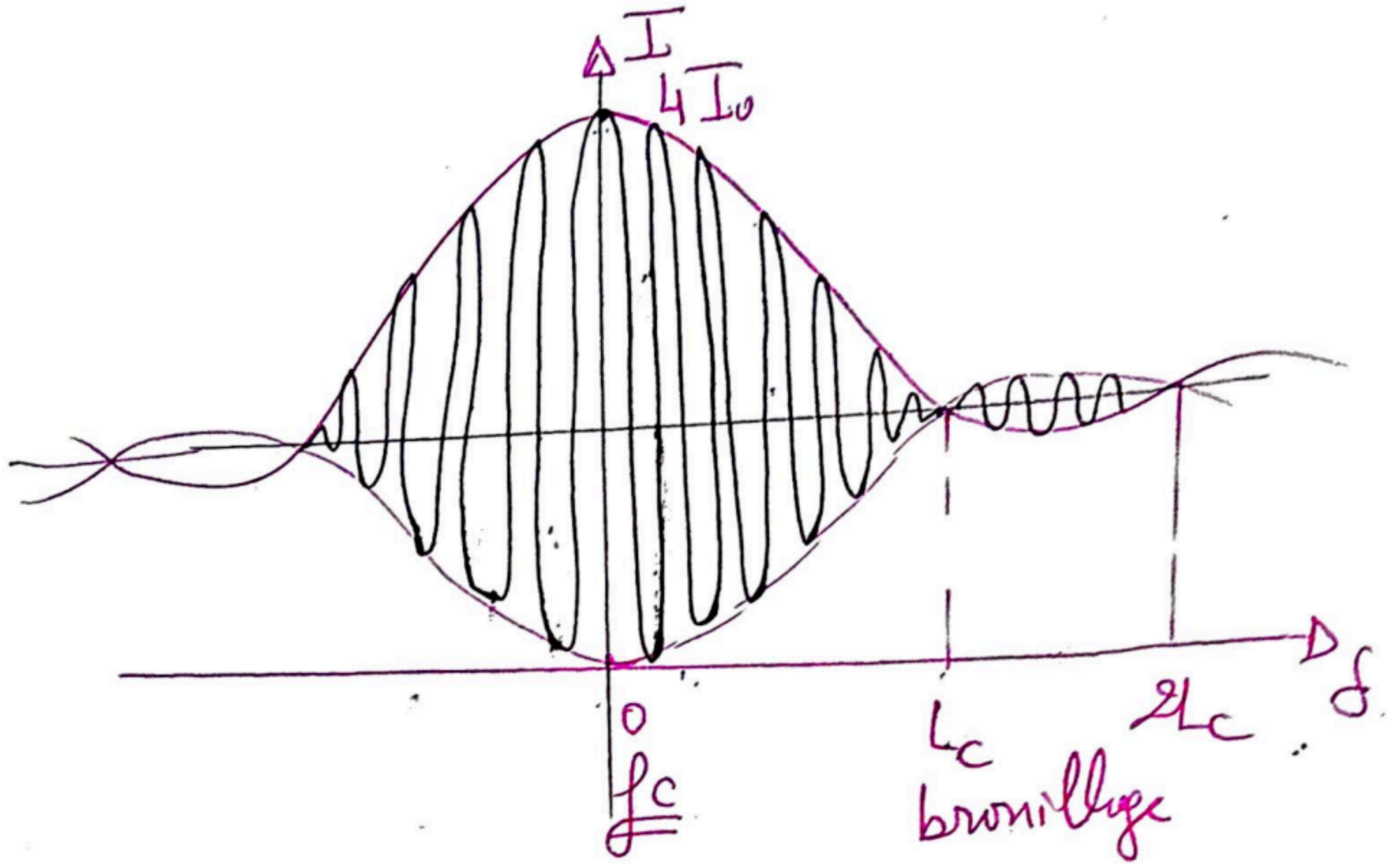
$$\nu = \frac{1}{\lambda} = nbs \text{ d'onde} \Rightarrow \Delta \nu = \frac{\Delta \lambda}{\lambda_0^2}$$

$$dI = 2I_0 \left(1 + \cos(2\pi \delta \nu)\right) d\nu$$

$$I = \frac{2I_0}{\Delta \nu} \left(1 + \cos(2\pi \delta \nu)\right) d\nu$$

$$V(\delta) = \sin c(\pi \delta \Delta \nu)$$

$$L_c = \frac{1}{\Delta \nu} = \frac{c}{\Delta \nu} = \frac{\lambda_0^2}{\Delta \lambda}$$



$$|V| = C$$

$$I_{max} = 2I_0 (1 + |V(\delta)|) < 4I_0$$

$$I_{min} = 2I_0 (1 - |V(\delta)|) > 0$$

$$d) \nu_0 \quad \nu_2 = \nu_0 + \frac{\Delta \nu}{2}$$

$$p_0 = \frac{\delta}{c} \nu_0 \quad ; \quad p_2 = \frac{\delta}{c} \left(\nu_0 + \frac{\Delta \nu}{2} \right)$$

$$p_2 - p_0 = \frac{1}{2} = \frac{\delta}{c} \frac{\Delta v}{2}$$

$$\delta = \frac{c}{\Delta v} = L_c$$

B) source bichromatique λ_1, λ_2

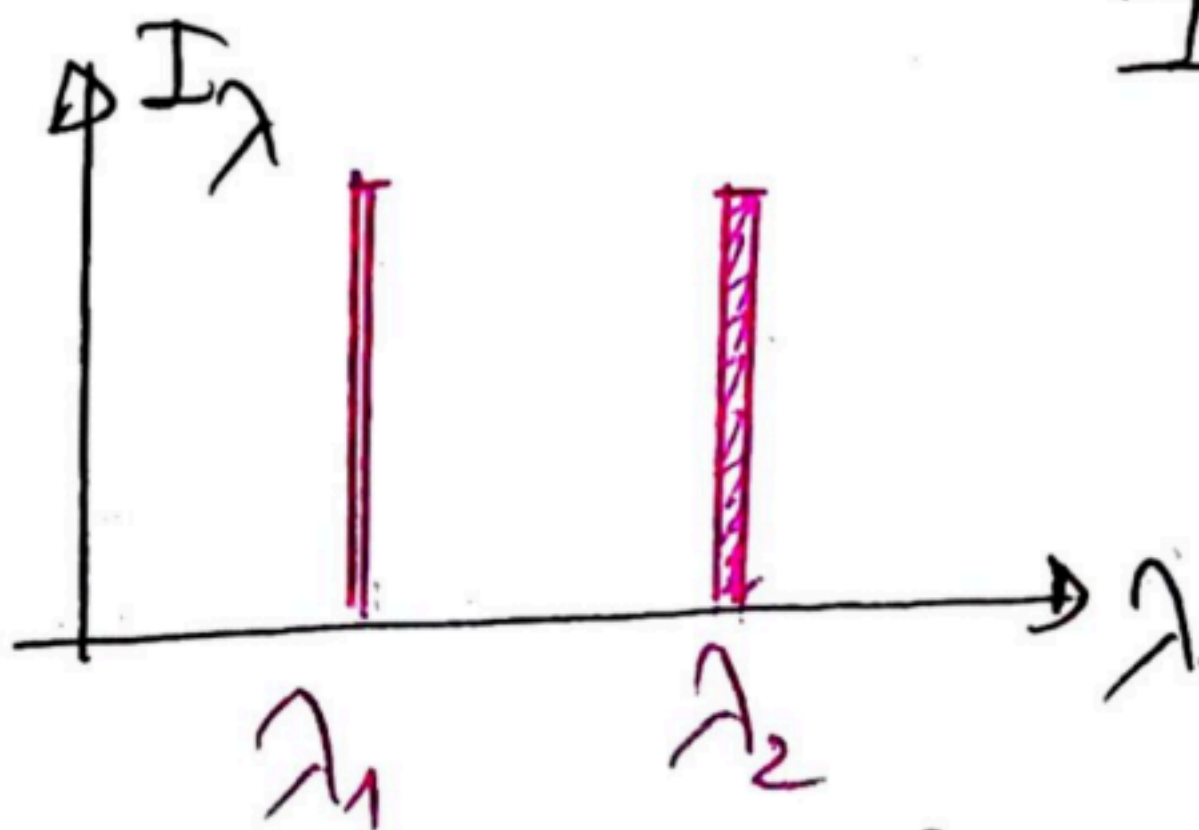
Na $\Delta\lambda_{Na} = 6\text{\AA}$

$$\lambda_1 = \lambda_0 - \frac{\Delta\lambda}{2}, \quad \lambda_1 \lambda_2 \approx \lambda_0^2$$

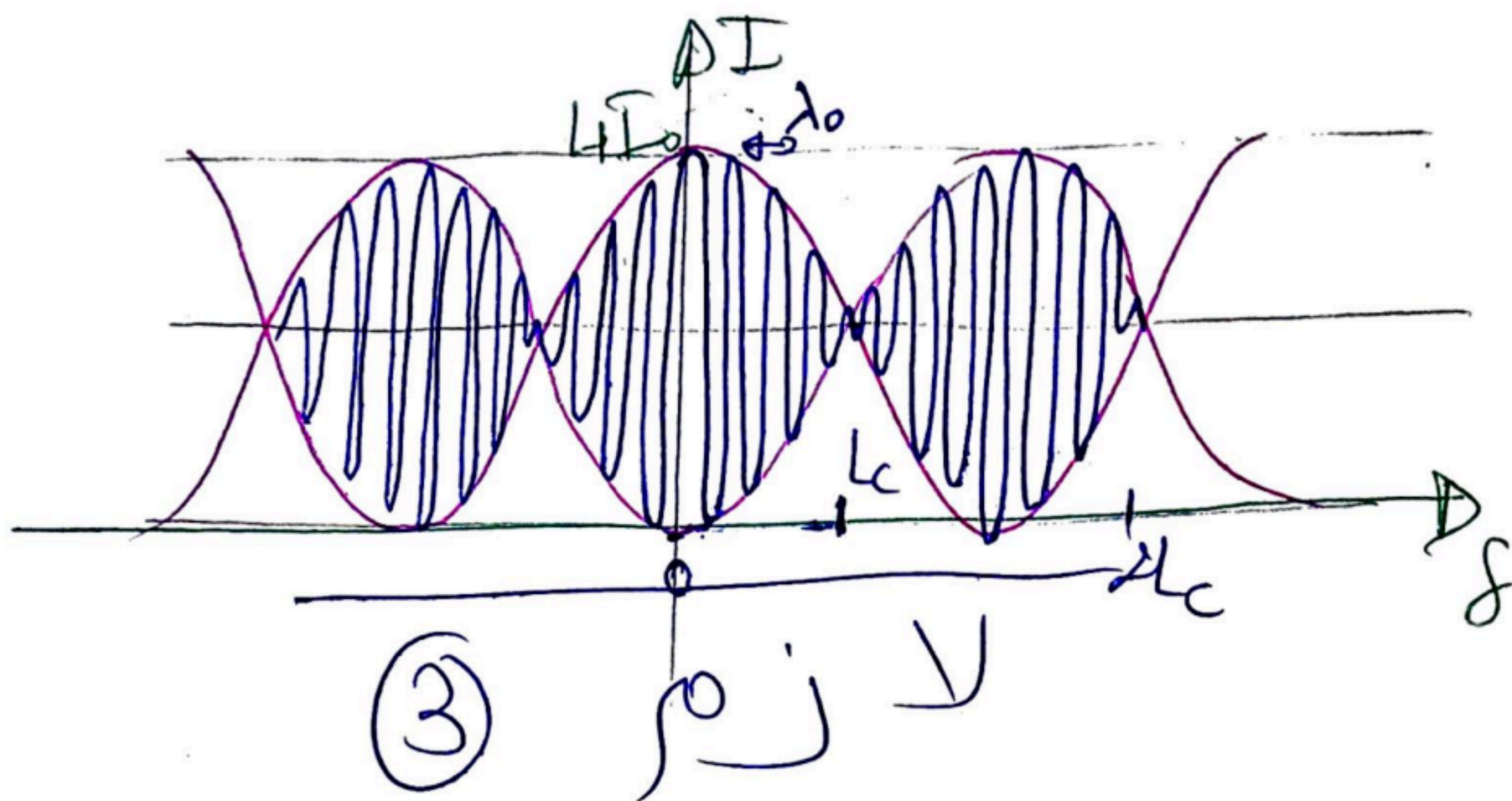
$$\lambda_2 = \lambda_0 + \frac{\Delta\lambda}{2}$$

$$* \frac{1}{\lambda_1} + \frac{1}{\lambda_2} = \frac{\lambda_1 + \lambda_2}{\lambda_1 \lambda_2} \approx \frac{2\lambda_0}{\lambda_0^2} = \frac{2}{\lambda_0}$$

$$* \frac{1}{\lambda_1} - \frac{1}{\lambda_2} = \frac{\Delta\lambda}{\lambda_0^2}$$



$$\begin{aligned} I &= I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \phi \\ &= \frac{I_0}{2} + \frac{I_0}{2} + 2 \frac{I_0}{2} \cos(\phi) \end{aligned}$$



méthode semi-quantitative

$$\delta = p_1 \lambda_1 = p_2 \lambda_2 \Rightarrow \frac{\lambda_1 < \lambda_2}{p_1 > p_2}$$

$$p_2 = k$$

$$p_1 = k + \frac{1}{2} + m$$

$$p_1 - p_2 = \left(m + \frac{1}{2}\right) = \frac{\delta}{\lambda_1} - \frac{\delta}{\lambda_2} = \frac{\Delta \lambda \delta}{\lambda_0^2}$$

$$\delta = \left(m + \frac{1}{2}\right) \frac{\lambda_0^2}{\Delta \lambda}$$

Déterminer p_1 et $p_2 = n$

$$I_{\lambda_1} = I_0 \left(1 + \cos\left(\frac{2\pi\delta}{\lambda_1}\right) \right)$$

$$I_{\lambda_2} = I_0 \left(1 + \cos\left(\frac{2\pi\delta}{\lambda_2}\right) \right)$$

$$I = I_{\lambda_1} + I_{\lambda_2}$$

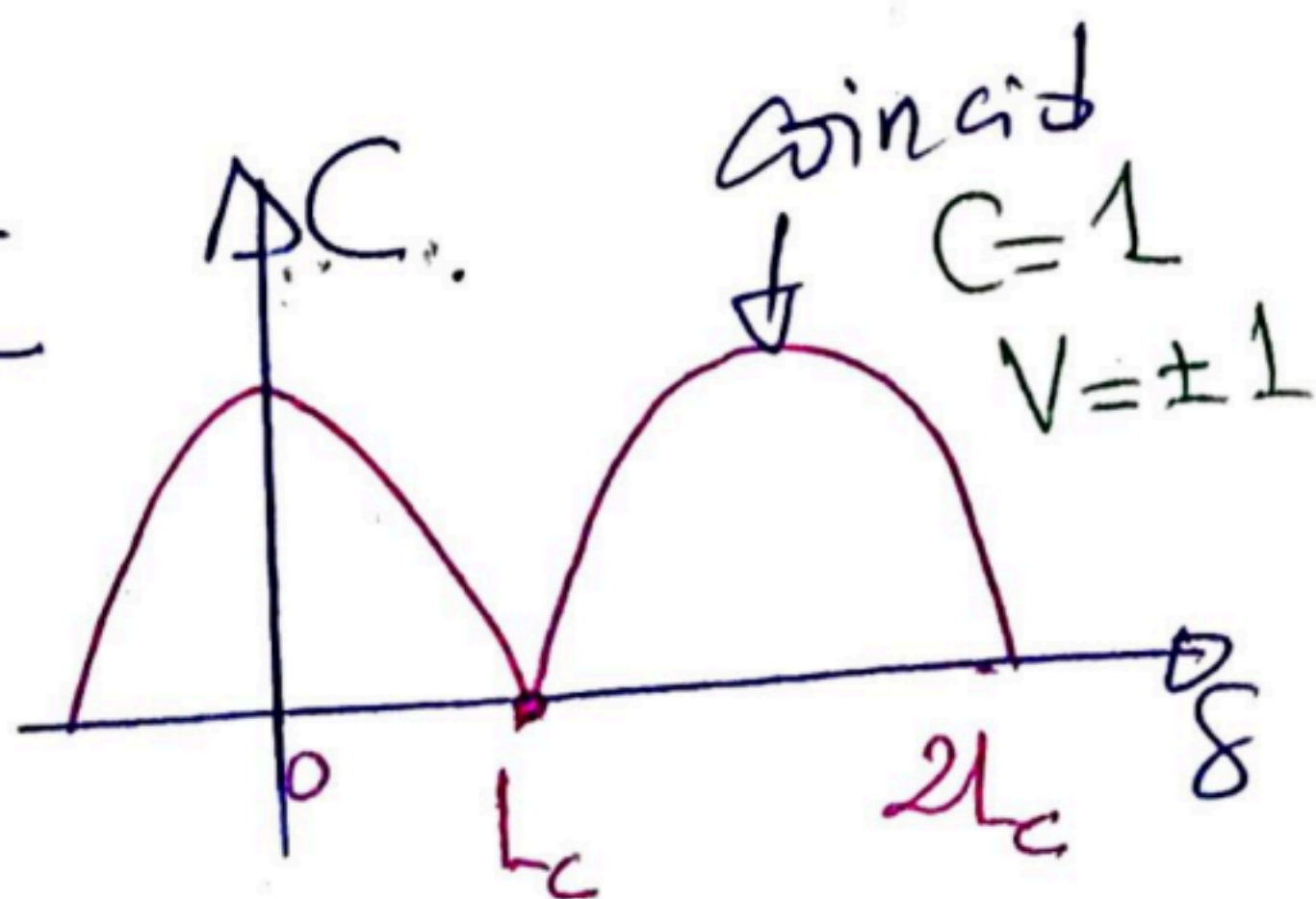
$$= 2I_0 \left(1 + \cos\left(\frac{\pi\delta\Delta\lambda}{\lambda_0^2}\right) \cos\left(\frac{2\pi\delta}{\lambda_0}\right) \right)$$

periode $\frac{2\lambda_0^2}{\Delta\lambda}$

$\gg$

λ_0

$$\left| \cos\left(\frac{\pi\delta\Delta\lambda}{\lambda_0^2}\right) \right| = C$$



$$C=0 \leftarrow$$

$$\frac{\pi\delta\Delta\lambda}{\lambda_0^2} = \left(m + \frac{1}{2}\right)\pi$$

$$\delta = \left(m + \frac{1}{2}\right) \frac{\lambda_0^2}{\Delta\lambda} = \frac{\alpha\lambda_{ant}}{D}$$

$$p_1 \lambda_1 = p_2 \lambda_2 = (p_2 + \frac{1}{2} + m) \lambda_1$$

$$p_2 (\lambda_2 - \lambda_1) = (m + \frac{1}{2}) \lambda_1$$

$$p_2 = (m + \frac{1}{2}) \frac{\lambda_1}{\Delta \lambda}$$

$$p_1 = p_2 + \frac{1}{2} + m$$

$m=0$ $\delta = \frac{\lambda_0^2}{2\Delta\lambda} = L_c$

$$p_2 = \frac{\lambda_1}{2\Delta\lambda} ; \quad p_1 = p_2 + \frac{1}{2}$$

$m=1 ;$ $\delta = \frac{3}{2} \frac{\lambda_0^2}{\Delta\lambda}$

$$p_2 = \frac{3}{2} \frac{\lambda_1}{\Delta\lambda} \quad p_1 = p_2 + \frac{3}{2}$$

Rq Déterminer le nb de franges.
 $0 \rightarrow L_c$, $\frac{L_c}{\lambda_0} = \frac{\lambda_0}{2\Delta\lambda} = 400$

1) Lumière blanche

$$\lambda_v \leq \lambda \leq \lambda_r$$

400

700 nm

$$L_c = \frac{c}{\Delta \nu}$$

$$L_c = \frac{c}{\nu_v - \nu_r} = \frac{c}{\frac{1}{\lambda_v} - \frac{1}{\lambda_r}}$$

$$L_c = \frac{\lambda_v \lambda_r}{\lambda_r - \lambda_v} \quad c = 1 \mu\text{m}$$

2) on observe la frange centrale nette
blanche ($\delta = p \lambda = 0$) $\forall \lambda$

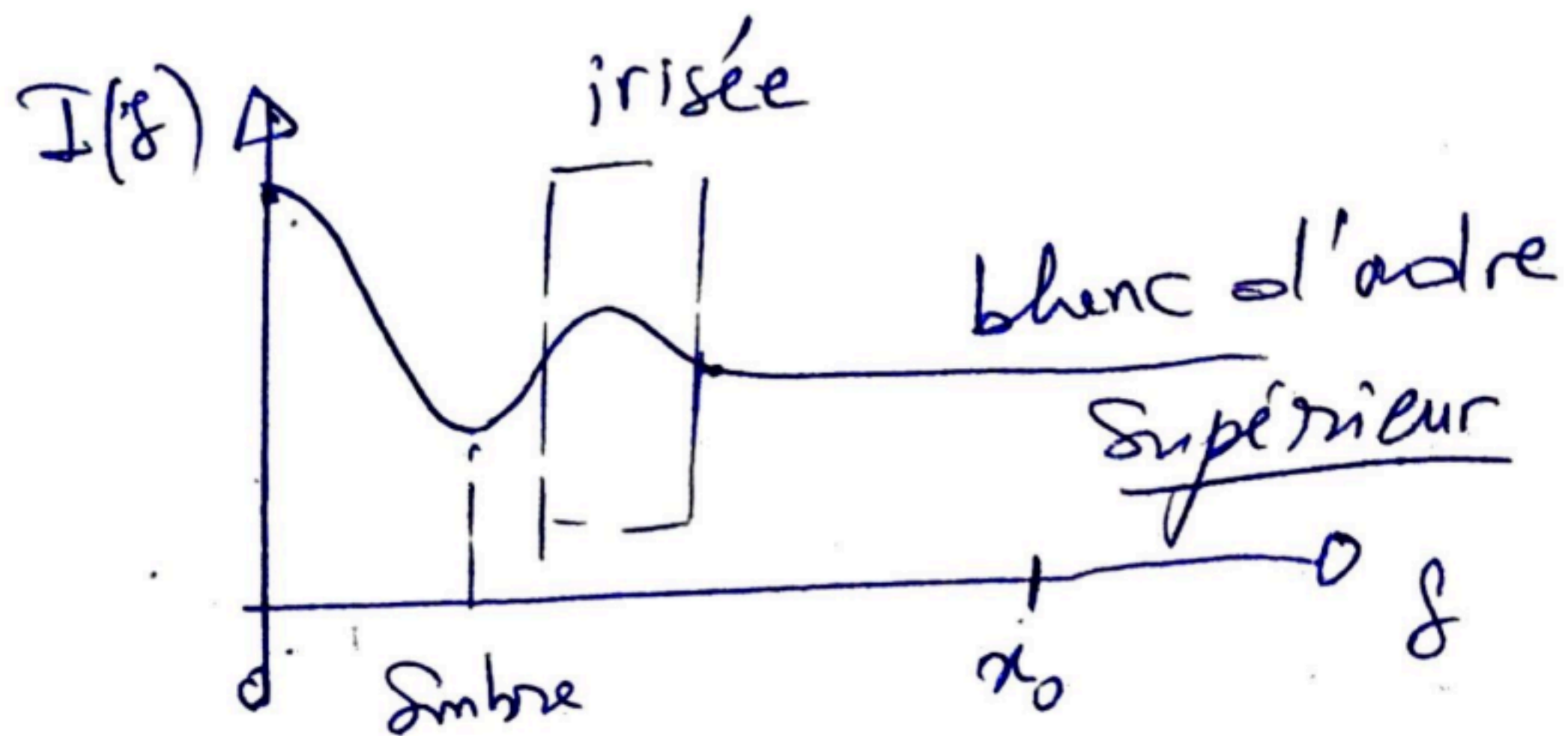
• deux franges sombres

• des franges irisées (colorés)

• blanc d'ordre supérieur

(blanc qui manque qq λ)

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2) spectroscope: arc en ciel qui manque des radiations, (qui présente des bandes noires) : annelures : spectre annelé

bande noire annelure $\Rightarrow I=0$

$$\delta = \left(k + \frac{1}{2}\right) \lambda \Rightarrow \delta = \frac{a n_0}{D} = \left(k + \frac{1}{2}\right) \lambda$$

$$\lambda_v \leq \lambda = \frac{a n_0}{D \left(k + \frac{1}{2}\right)} \leq \lambda_R$$

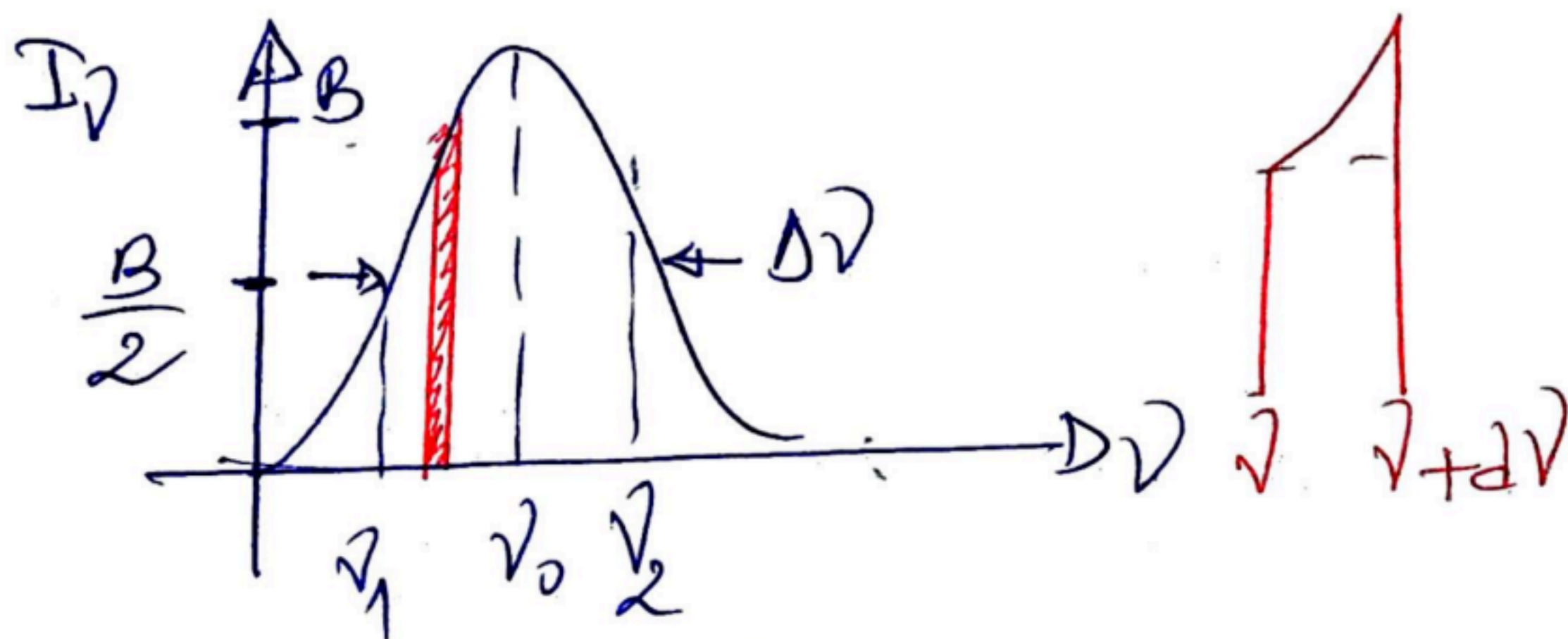
$$\left(\frac{a n_0}{\lambda_R D} - \frac{1}{2}\right) \leq k \leq \left(\frac{a n_0}{\lambda_v D} - \frac{1}{2}\right) \dots$$

$$6,6 \leq k \leq 12$$

exple

$$k = 7; 8; 9; 10; 11; 12$$

$$I_\nu(\nu) = B \exp\left[-\frac{(\nu - \nu_0)^2}{\alpha^2}\right]$$



$$B \exp\left[-\frac{(\nu - \nu_0)^2}{\alpha^2}\right] = \frac{B}{2}$$

$$\left(\frac{\nu - \nu_0}{\alpha}\right) = \pm \sqrt{\ln 2}$$

$$\nu = \nu_0 - \alpha \sqrt{\ln 2}$$

$$\nu_2 = \nu_0 + \alpha \sqrt{\ln 2}$$

$$\Delta\nu = 2\alpha \sqrt{\ln 2}$$

Dém $I(\nu) = 2I_0 \left(1 + \cos\left(\frac{2\pi\delta\nu}{c}\right) \right) \times \exp\left(-\frac{\delta^2}{\gamma^2}\right)$

$$dI = 2 dI_0 \left(1 + \cos \left(\frac{2\pi \delta v}{c} \right) \right)$$

$$dI = 2 I_0(v) \left(1 + \cos \left(\frac{2\pi \delta v}{c} \right) \right) dv$$

$$e = \frac{dm}{2\rho} \Rightarrow m = \iiint \rho d\tau$$

$$m = eV$$



$$I = 2B \int_{-\infty}^{+\infty} \exp \left[-\frac{(v - v_0)^2}{\alpha^2} \right] \left(1 + \cos \left(\frac{2\pi \delta v}{c} \right) \right) dv$$

$$u = v - v_0, \quad v = u + v_0$$

$$I = 2B \int_{-\infty}^{+\infty} e^{-\frac{u^2}{\alpha^2}} \left(1 + \cos \left(\frac{2\pi \delta}{c} (u + v_0) \right) \right) du$$

$$= 2B \int_{-\infty}^{+\infty} e^{-\frac{u^2}{\alpha^2}} du + 2B \left[\int_{-\infty}^{+\infty} e^{-\frac{u^2}{\alpha^2}} \cos \left(\frac{2\pi \delta}{c} u \right) du \right] \times \cos \left(\frac{2\pi \delta v_0}{c} \right)$$

$$\int_{-\infty}^{+\infty} e^{-\frac{x^2}{2}} \cos(\beta x) dx = \alpha \sqrt{\pi} e^{-\frac{\alpha^2 \beta^2}{4}}$$

intégrée

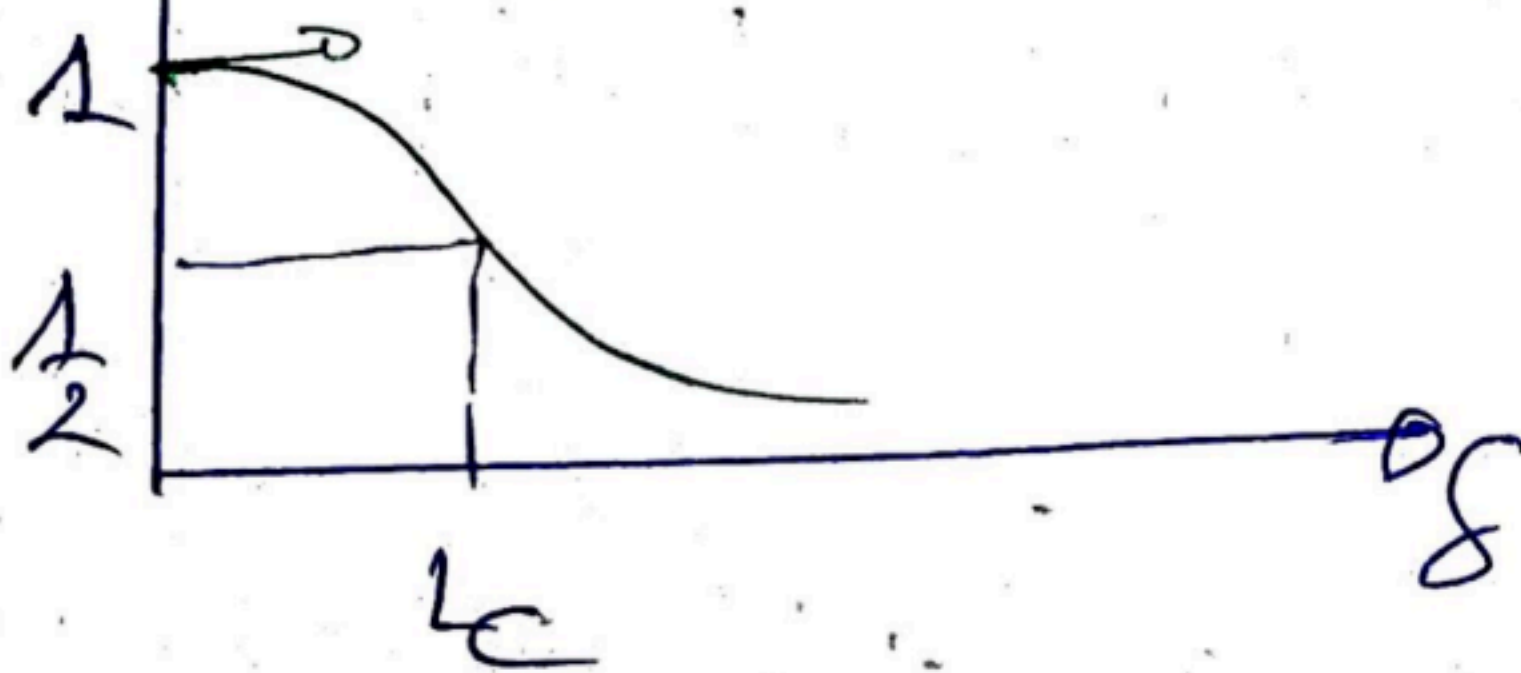
$$I = 2B \alpha \sqrt{\pi} \left[1 + \exp\left(-\frac{\alpha^2 \beta^2}{4}\right) \cos\left(\frac{2\alpha \beta \gamma_0}{C}\right) \right]$$

$$\beta = \frac{2\pi f}{C}$$

$$\exp\left(-\frac{\alpha^2 4\pi^2 f^2}{4 \cdot C^2}\right) = \exp\left[-\frac{f^2}{\left(\frac{C}{\alpha\pi}\right)^2}\right]$$

$$\gamma = \frac{C}{\alpha\pi}$$

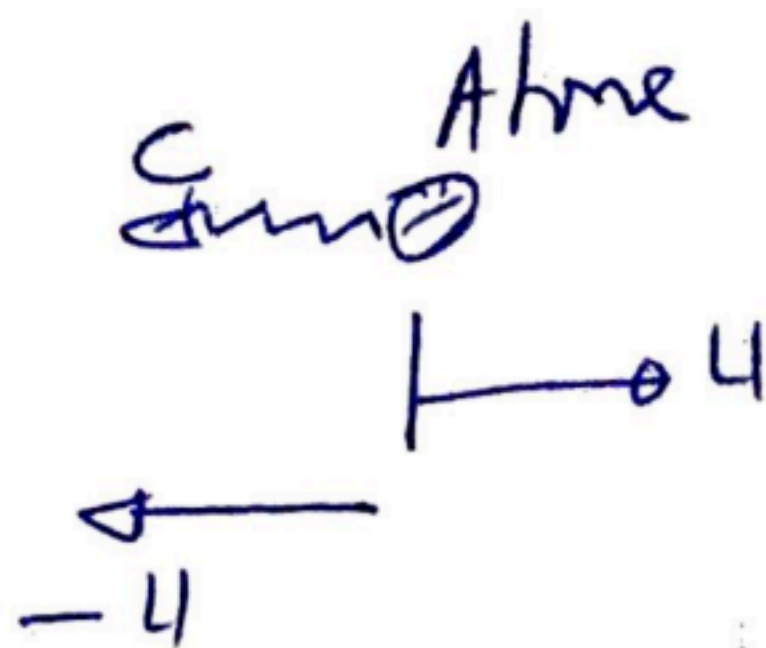
$$\Delta C = |V| = \exp\left(-\frac{f^2}{\gamma^2}\right)$$



MP 2001

Effet Doppler

Déteur



$$\nu_1 = \nu_0 \left(1 - \frac{u}{c}\right); \quad \Delta \nu_{\text{Doppler}} = \frac{2u}{c} \nu_0$$

$$\nu_2 = \nu_0 \left(1 + \frac{u}{c}\right)$$

• Effet thermique

$$[\nu_x; \nu_x + d\nu_x]$$

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$$dN = N \sqrt{\frac{M}{2RT}} \exp\left(-\frac{M \nu_x^2}{2RT}\right) d\nu_x$$

$$dN = -\frac{c}{\nu_0} N \sqrt{\frac{M}{2RT}} \exp\left[-\frac{M c^2 (\nu - \nu_0)^2}{2RT \nu_0^2}\right] d\nu$$

$$\nu = \nu_0 \left(1 - \frac{\nu_x}{c}\right) \Rightarrow \nu_x = \frac{c}{\nu_0} (\nu_0 - \nu)$$

$$d\nu_x = -\frac{c}{\nu_0} d\nu$$

$$dI_{\text{source}} = K dN = \beta \exp\left[-\frac{(\nu - \nu_0)^2}{\alpha^2}\right] d\nu$$

