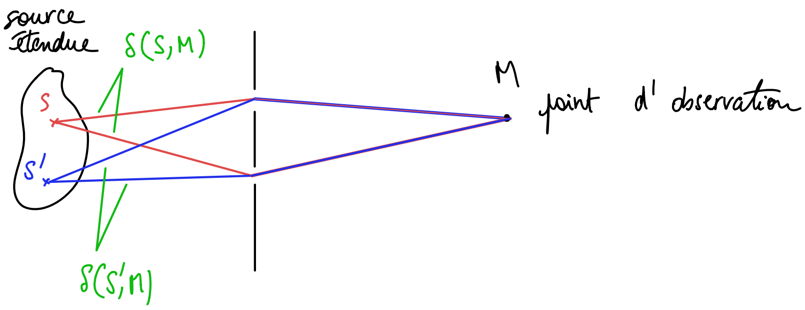
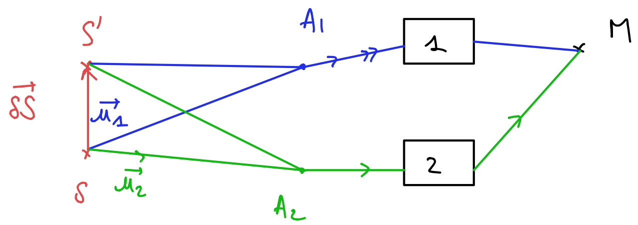
I) 1.



2. interféromètre à deux voies stigmatiques



- $\delta(S,M) = (SM)_2 - (SM)_1 = SA_2 + L_2 - SA_1 - L_1$

  idem $S' \leftrightarrow S$

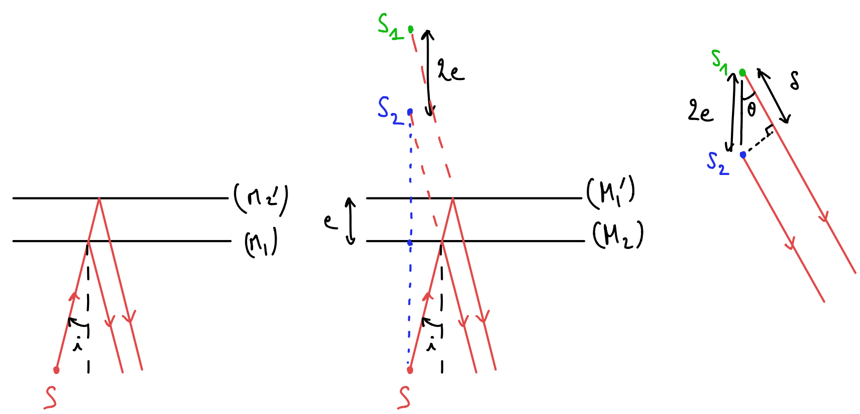
- $\delta(S',M) - \delta(S,M) = (S'A_2 - SA_2) - (S'A_1 - SA_1)$

$$\text{or} \quad d(SA_1) = d(\vec{SA_1} \cdot \vec{u_1}) = \underbrace{(d\vec{SA_1}.)}_{\substack{\vec{S'A_1} - \vec{SA_1} \\ = \vec{S'S} + O\left(\frac{(S'S)^2}{SA_i}\right)}} \vec{u_1} + \underbrace{\vec{SA_1}\, d\vec{u_1}}_{\substack{SA_1 \underbrace{\vec{u_1} \cdot d\vec{u_1}}_{\underbrace{\frac{1}{2} d(\vec{u_1}^2)}_{0}}}}$$

$$d(SA_1) = \vec{S'S} \cdot \vec{u_1}$$

$$\rightarrow \quad \boxed{\delta(S',M) - \delta(S,M) = \vec{S'S} \cdot (\vec{u_2} - \vec{u_1}) + O\left(\frac{(S'S)^2}{SA_i}\right)}$$

I 2. lame d'air



différence de marche : par stigmatisme des miroirs, tout se passe comme si les rayons émergents venaient de 2 sources ponctuelles S_1 et S_2

$$\rightarrow \quad \boxed{\delta = 2ne\cos i}$$

- formule de Fresnel : $I(i) = \frac{I_{max}}{2}\left(1+\cos\left(\frac{2\pi}{\lambda}\, 2ne\cos(i)\right)\right)$
- doublet du sodium : $I(i) = \frac{I_{max}}{2}\left(1+\cos\left(\frac{2\pi}{\lambda_1}\delta\right)\right) + \frac{I_{max}}{2}\left(1+\cos\left(\frac{2\pi}{\lambda_2}\delta\right)\right)$

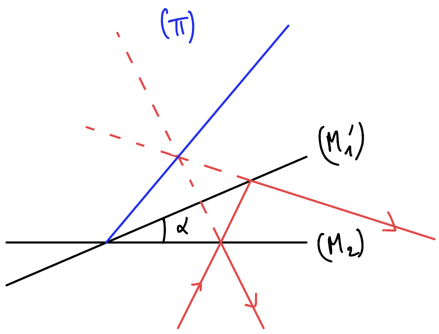
$$= I_{max}\left(1+\frac{1}{2}\left(\cos\left(\frac{2\pi}{\lambda_1}\delta\right)+\cos\left(\frac{2\pi}{\lambda_2}\delta\right)\right)\right)$$

$$= I_{max}\left(1+\left\{\underbrace{\cos\left(\frac{(k_1+k_2)}{2}\delta\right)}_{\text{franges}}\underbrace{\cos\left(\left(\frac{k_1-k_2}{2}\right)\delta\right)}_{\text{contraste}}\right\}\right)$$

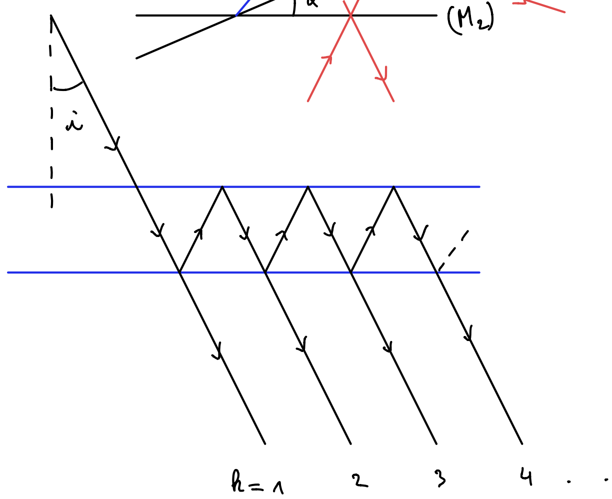
où $\frac{k_1-k_2}{2} = \frac{\Delta k}{2} = \frac{1}{2}\Delta\left(\frac{2\pi}{\lambda}\right) \simeq \frac{1}{2}\cdot\frac{2\pi\,\Delta\lambda}{\lambda^2}$

au centre, $\delta = 2e$, contraste $C(e) = \cos\left(2\pi\frac{\Delta\lambda}{\lambda^2}e\right)$ $\qquad e_n = \frac{1}{2}\left(\frac{1}{2}+n\right)\frac{\lambda_0^2}{\Delta\lambda}$

3. Coin d'air



3. 1.



amplitude complexe $\qquad E_1 = t_{12}t_{21}E_0 \leftarrow$ référence de phase

$E_2 = t_{12}\, r_{12}\, e^{i\Delta\varphi}\, r_{12}\, t_{21}\, E_0$ où $\Delta\varphi \overset{\text{idem Michelson}}{=} \frac{2\pi}{\lambda}\cdot 2ne\cos i$

$E_k = t_{12}\left(r_{12}e^{i\Delta\varphi}r_{12}\right)^{k-1}t_{21}E_0$

$$E_{TOT} = t_{12}t_{21}E_0\cdot\sum_{k=1}^{\infty}\left(r_{12}e^{i\Delta\varphi}r_{12}\right)^{k-1}$$

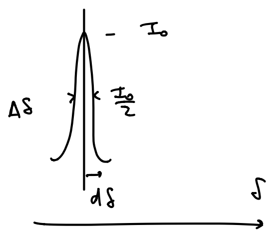
$$= \frac{t_{12}t_{21}E_0}{1-r_{12}^2e^{i\Delta\varphi}}$$

$$I_{TOT} = \frac{(1-R)^2 I_0}{1+R^2-\underset{\uparrow\, \pm 2R}{2R\cos\Delta\varphi}} = \frac{I_0}{1+\frac{2R(1-\cos\Delta\varphi)}{(1-R)^2}}$$

$$\boxed{I_{TOT} = \frac{I_0}{1 + \underbrace{\frac{4R}{(1-R)^2}}_{m} \cdot \sin^2\left(\frac{\Delta\varphi}{2}\right)}}$$

$\cos 2x = \cos^2 - \sin^2$
$= 1 - 2\sin^2$

2. Pouvoir de résolution : $PR = \frac{\lambda}{\Delta\lambda}$ où $\delta = p\lambda$ à un pic



on cherche $d\delta$ tel que $I = \frac{I_0}{2}$ ie $m \sin^2\left(p\pi + \frac{k\,d\delta}{2}\right) = 1$

$\sin^2$ est π-périodique

$$\sin^2(p\pi + \varepsilon) = \sin^2(\varepsilon) \underset{\varepsilon \to 0}{\sim} \varepsilon$$

$$d\delta \sim \frac{2}{k} \cdot \frac{1}{\sqrt{m}} = \frac{\lambda}{\pi\sqrt{m}} = p\,d\lambda$$

autre résonance si $\lambda \to \lambda + d\lambda$

$$\Delta\delta = 2\,d\delta = p\,\Delta\lambda$$

↳ $PR = p\,\frac{\pi\sqrt{m}}{2} = p\,\mathcal{F}$