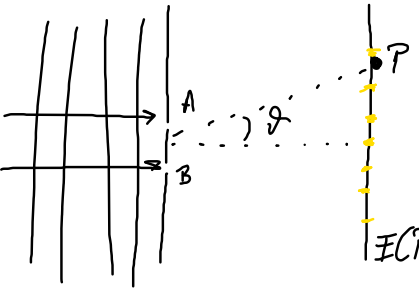


luce piena $\sin\vartheta = n\lambda/d$ $n = 0, \pm 1, \pm 2 \dots$

Buio totale $\sin\vartheta = (n + \frac{1}{2})\lambda/d$

$$E(P,t) = 2E_0 \cos\left(\frac{kd\sin\vartheta}{2}\right) \cos\left(kd_{AP} - \omega t + \frac{kd_{AP}\sin\vartheta}{2}\right)$$

$I = \langle S \rangle = \frac{c\varepsilon_0}{2} E_{max}^2$

semplice funzione di ϑ

$$I = \frac{c\varepsilon_0}{2} 4E_0^2 \cos^2\left(\frac{kd\sin\vartheta}{2}\right) = I(\vartheta)$$

$$= 4I_0 \cos^2\left(\frac{kd\sin\vartheta}{2}\right)$$

luce piena: $2E_0 = E_{TOT}$

$I_{max} = \frac{c\varepsilon_0}{2} \cdot 4E_0^2 = 4I_0$

$0 \le I \le 4I_0$

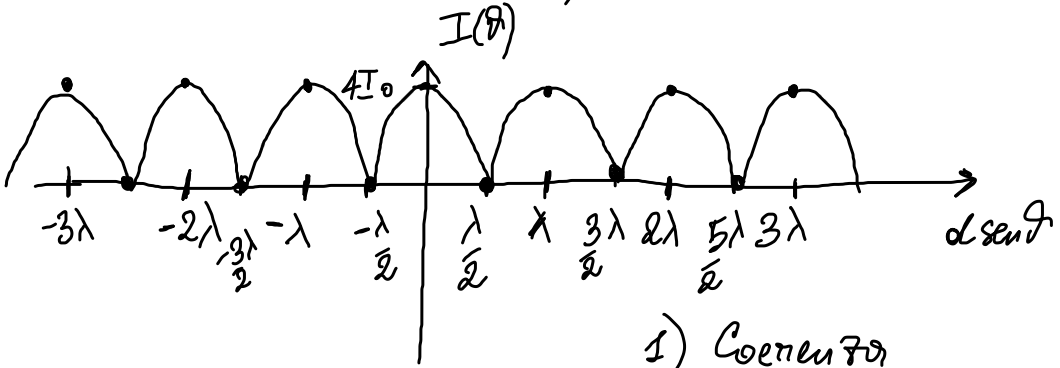
luce piena: $\frac{kd\sin\vartheta}{2} = n\pi$ $n = 0, \pm 1, \pm 2 \dots$

$\frac{2\pi}{\lambda} d\sin\vartheta = n\pi$, $d\sin\vartheta = n\lambda$

Buio:

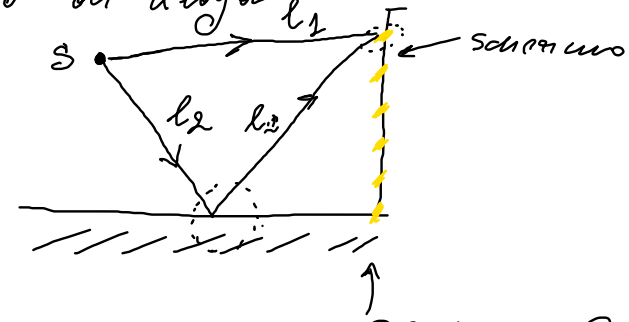
$$\frac{k d \operatorname{sen}\vartheta}{2} = \frac{\pi}{2} + n\pi \qquad n = 0, \pm 1, \pm 2 \ldots$$

$$\frac{2\pi}{\lambda} \frac{d \operatorname{sen}\vartheta}{2} = \pi\left(n + \frac{1}{2}\right) \; ; \; d \operatorname{sen}\vartheta = \left(n + \frac{1}{2}\right)\lambda$$



1) Coerenza
2) Monocromaticità

Specchio di Lloyd



Differenza dovuta a differente cammino geometrico tra raggi che raggiungono lo schermo
→ direttamente
→ a seguito di riflessione

Punti di luce piena: $l_1 - l_2 = n\lambda$

$n = 0, \pm 1, \pm 2 \ldots$

Si osserva: buio dove è prevista luce piena e viceversa

Cosa fa la riflessione al $\vec{E}$?

$$E(x,t) = E_0 \cos(\underbrace{kx - \omega t}_{\text{fase}})$$

Se $x \longrightarrow x + d$

$$k(x+d) - \omega t = \underbrace{kx - \omega t}_{\varphi_0} + \underbrace{kd}_{\Delta\varphi} \Rightarrow \Delta\varphi = \frac{2\pi}{\lambda} d$$

Se $d = n\lambda \qquad n = 0, \pm 1, \pm 2 \ldots$

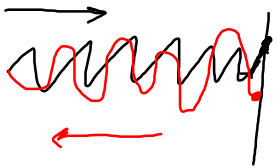
$\Delta\varphi = 2\pi n$ (interf. compl. costruttiva)

Se $d = \frac{\lambda}{2} + n\lambda$ $\quad \Delta\varphi = \frac{2\pi}{\lambda}\left(\frac{\lambda}{2} + n\lambda\right) = \pi + n 2\pi$ (interf. compl. distruttiva)

$\Rightarrow$ la riflessione produce uno sfasamento di π alla fase dell'onda

$$\underline{E}_0 \longrightarrow \underline{E}_0 \cos(\pi) = -E_0$$

$\underline{E}_0$ ↑ riflessione ↓ $\underline{E}_0$



Sfasamento di π per riflessione si osserva solo nella riflessione tra mezzo (otticamente) meno denso e più denso (es. aria–vetro)

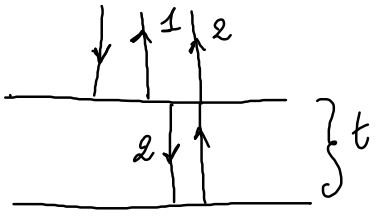
Interferenza su lamine sottili

n_1

acqua n_2

$n_2 < n_1$

Interferenza tra raggi riflettono "subito" ↔ attraverso la lamina



Raggio 1: $\varphi_1 = \pi$

Raggio 2:

$\lambda_n = \frac{\lambda_0}{n_2}$

$$\varphi_2 = \underbrace{\frac{2\pi t}{\lambda_n}}_{\text{prima attr. lamina}} + \underbrace{0}_{\substack{\text{riflessione} \\ \text{su mezzo} \\ \text{meno denso}}} + \underbrace{\frac{2\pi t}{\lambda_n}}_{\substack{\text{secondo attr.} \\ \text{lamina}}} = \frac{4\pi t n_2}{\lambda_0}$$

$$\Delta\varphi = \varphi_2 - \varphi_1 = \frac{4\pi t n_2}{\lambda_0} - \pi$$

Interf. tot. costruttiva è per

$$\Delta\varphi = 2\pi m \qquad m = 0, \pm 1, \pm 2 \ldots$$

$$\frac{4\pi t}{\lambda_0} n_2 - \pi = 2\pi m ; \qquad \frac{4\pi t n_2}{\lambda_0} = \pi(2m+1)$$

$$\lambda_0 = \frac{4 t n_2}{2m+1}$$

"Colori" osservati bene $\lambda_0 = 4 t n_2$, $\frac{4 t n_2}{3}$, $\frac{4 t n_2}{5}$ ...

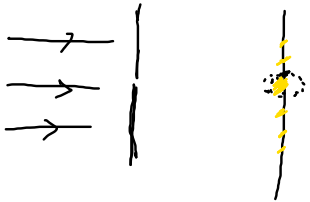
Interf. tot. distruttiva per

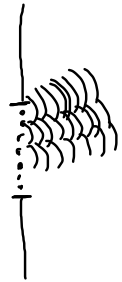
$$\Delta\varphi = \pi + 2\pi m$$

$$\frac{4\pi t n_2}{\lambda_0} - \pi = \pi + 2m\pi$$

$$\frac{4\pi t n_2}{\lambda_0} = 2\pi(m+1) ; \quad \lambda_0 = \frac{2 n_2 t}{m+1}$$

Diffrazione

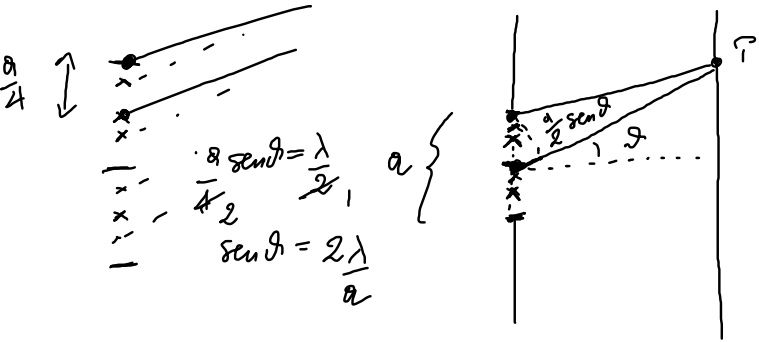




Diffrazione: l'interferenza tra infinite onde secondarie prodotte da sorgenti infinitesime

$\lambda \sim a$

$\lambda \leq a$



Interf. costruttiva se $\frac{a}{2}\sin\vartheta = n\lambda$ $\quad \sin\vartheta \geq 0$

Primo punto di buio $\frac{a}{2}\sin\vartheta = \frac{\lambda}{2}$ / $\sin\vartheta = \frac{\lambda}{a}$

$\sin\vartheta = \frac{n\lambda}{a}$ $\quad n = \pm 1, \pm 2, \pm 3 \ldots$