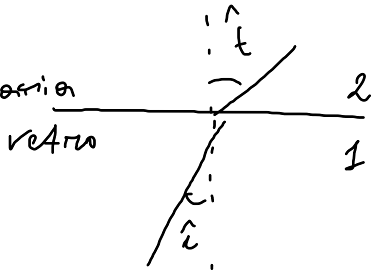
Se $n_2 < n_1$; $\frac{n_2}{n_1} < 1$



$$\operatorname{sen}\hat{i} = \frac{n_2}{n_1}\operatorname{sen}\hat{t} \Rightarrow \operatorname{sen}\hat{i} < \operatorname{sen}\hat{t}$$

$$\Rightarrow \hat{i} < \hat{t}$$

$$\hat{i}, \hat{t} < \pi/2$$

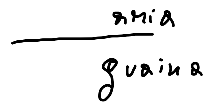
Per quale $\hat{i}$ si ha $\hat{t} = \pi/2$

$$\operatorname{sen}\hat{i}_{cr} = \frac{n_2}{n_1}$$

Se $\hat{i} > \hat{i}_{cr}$: <u>non</u> c'è rifrazione, c'è solo riflessione (riflessione totale)

Fibre ottiche:

$n_{guaina} > n_{aria}$



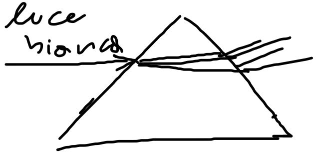
Se passiamo ad onde: tra 2 mezzi

$\nu = \text{const}$

$\lambda = \dfrac{\lambda_{vuoto}}{n}$

$v = \dfrac{c}{n}$

Dispersione

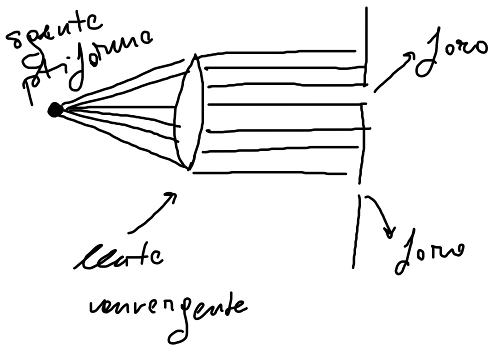


$n \simeq A + \dfrac{B}{\lambda^2}$

A, B cost. dip. dal materiale

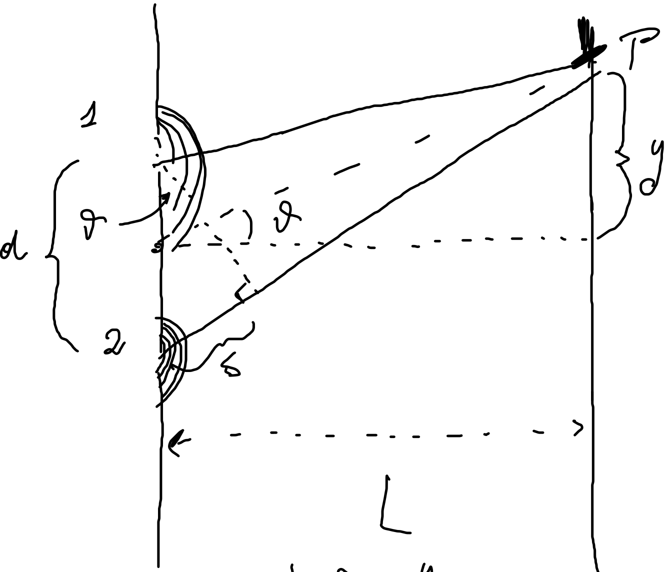
Fenomeni di interferenza

Exp. di Thomas Young



Ottica geometrica: luce solo davanti ai fori

Exp: alternanza bande luminose e scure

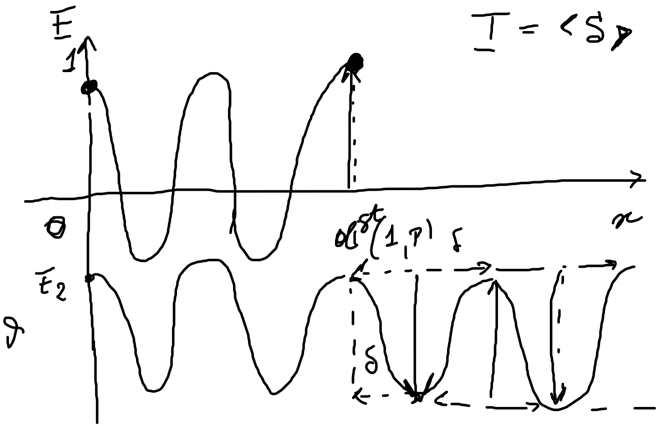


Schermo sia abbastanza dist. dalle fenditure

Raggio (1,P) e Raggio (2,P) siano paralleli

$\delta = d \operatorname{sen} \vartheta$

$I = \langle S \rangle = c \frac{1}{2} \varepsilon_0 E_0^2$



$\operatorname{tg} \vartheta = y/L$

$\vartheta \ll 1 \quad \operatorname{sen}\vartheta \sim \vartheta \sim \operatorname{tg}\vartheta$

Se $\delta = m\lambda$ $m = 0, 1, 2, 3 \dots$
$-1, -2, -3 \dots$
$\Rightarrow$ interferenza compl. costruttiva
luce piena

Se $\delta = \frac{\lambda}{2} + m\lambda$ $\Rightarrow$ interf. compl. distruttiva
buio totale

Luce dove $\overbrace{d \operatorname{sen}\vartheta}^{\delta} = m\lambda$

$\operatorname{sen}\vartheta \simeq \vartheta \simeq \operatorname{tg}\vartheta$ $\quad d \frac{y}{L} \simeq m\lambda \; ; \quad y_{\substack{LUCE\\PIENA}} = m \frac{\lambda L}{d}$ $\quad m = 0, \pm 1, \pm 2 \dots$

bande luminose

$d \frac{y_{BUIO}}{L} \simeq \frac{\lambda}{2} + m\lambda \qquad y_{BUIO} \simeq \left(m + \frac{1}{2}\right) \frac{\lambda L}{d}$

Intensità della luce

Interf. compl. costruttiva $E_{TOT} = E_0 + E_0 = 2E_0$

$$I = \langle S \rangle = \frac{1}{2}\varepsilon_0 E_{TOT}^2 \cdot c$$

$$I \propto E^2$$

$$I = \frac{1}{2}\varepsilon_0 (2E_0)^2 \cdot c = 4 \underbrace{\frac{1}{2}\varepsilon_0 E_0^2 c}_{I_0} = 4I_0$$

Interf. compl. distr. $E_{TOT} = 0$

$$I = 0$$

$$\langle I \rangle = \frac{I_{LUCE} + I_{BUIO}}{2} = \frac{4I_0}{2} = 2I_0$$

Intensità nei punti intermedi

P

$$E_1 = E_0 \cos(kx - \omega t) = E_0 \cos(k \cdot D - \omega t)$$

$x = d(P,1) \overset{\text{def}}{=} D$

$$E_2 = E_0 \cos(k\, d(P,2) - \omega t) = E_0 \cos(k(D + \delta) - \omega t) =$$
$$= E_0 \cos(kD - \omega t + k\delta)$$

$d(P,2) = d(P,1) + \delta = D + \delta$

$$E_{TOT} = \overbrace{E_0 \cos(kD - \omega t)}^{E_1} + \overbrace{E_0 \cos(kD - \omega t + k\delta)}^{E_2}$$

$$\cos\alpha + \cos\beta = 2\cos\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$$ Formula di prostaferesi

$$E_{TOT} = 2E_0\cos\left[kD - \omega t + \frac{k\delta}{2}\right]\cos\left[\frac{k\delta}{2}\right] = A\cos\left(kD - \omega t + \frac{k\delta}{2}\right)$$

$\frac{\alpha+\beta}{2}$ ↗ $\quad$ $\frac{\alpha-\beta}{2}$ ↗

$$A(\vartheta) = 2E_0\cos\left(\frac{k}{2}d\,\mathrm{sen}\,\vartheta\right)$$

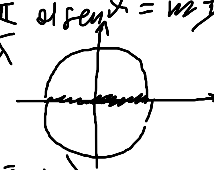
$$I(\vartheta) = \langle S\rangle = \frac{1}{2}\varepsilon_0 \cdot 4E_0^2\cos^2\left(\frac{k}{2}d\,\mathrm{sen}\,\vartheta\right) = 4I_0\cos^2\left(\frac{k}{2}d\,\mathrm{sen}\,\vartheta\right)$$

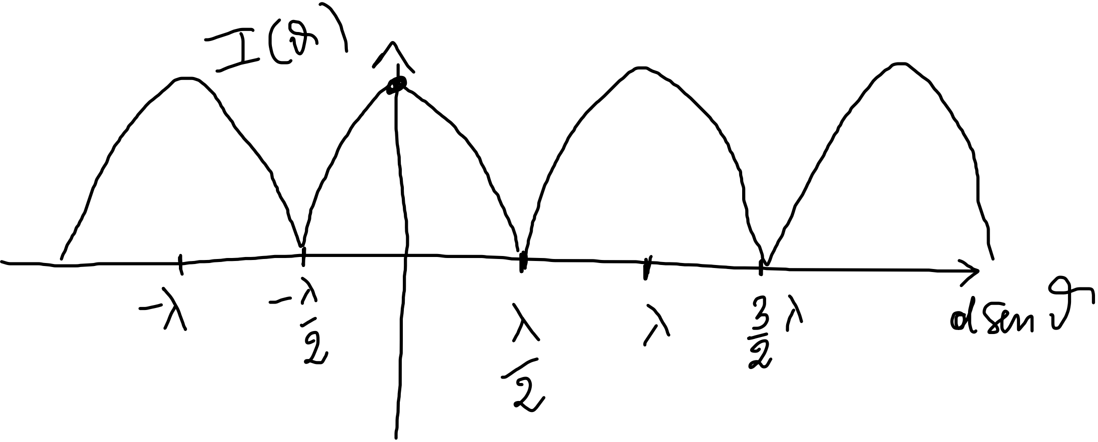
$I_{max} = 4I_0 \qquad I_{min} = 0$

↳ se $\cos^2(\quad) = 1$ < $\cos(\quad) = 1$ / $\cos(\quad) = -1$ } $\frac{k}{2}d\,\mathrm{sen}\,\vartheta = m\pi \rightarrow \frac{\pi}{\lambda}d\,\mathrm{sen}\,\vartheta = m\pi$

$m = 0, \pm 1 \ldots$

$d\,\mathrm{sen}\,\vartheta = m\lambda$




I(ϑ)
-λ
-λ/2
λ/2
λ
3/2 λ
d sen ϑ