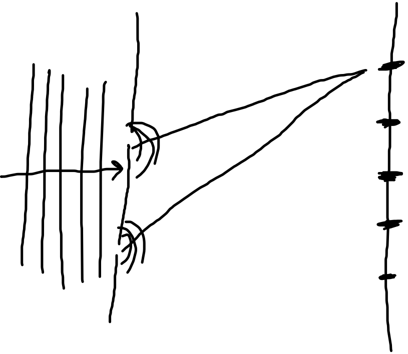
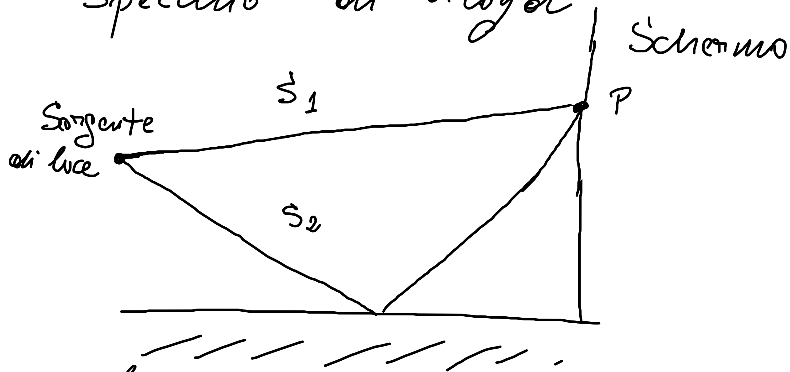


Specchio di Lloyd



S_1: lungh. tragitto diretto S_2: lungh. tragitto con riflessione

Tradizione: Luce piena: $S_1 - S_2 = m\lambda \quad m = 0, \pm 1, \pm 2 \dots$

Buio totale: $S_1 - S_2 = \frac{\lambda}{2} + m\lambda \quad m = 0, \pm 1, \pm 2 \dots$

Oss: luce piena e buio sono invertiti

Cosa succede alla fase dell'onda?

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

$x \longrightarrow x + d$ Fase: $k(x+d) - \omega t = kx - \omega t + \underbrace{kd} = \varphi + \Delta\varphi$

$$\boxed{\Delta\varphi = kd = \frac{2\pi}{\lambda_n} d}$$

In vuoto: $d = \frac{\lambda}{2}$

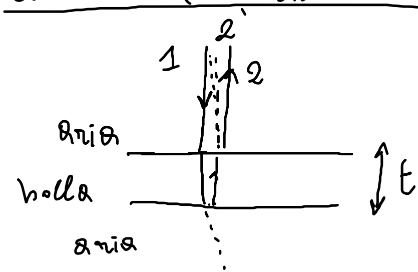
$$\Delta\varphi = \frac{\cancel{2}\pi}{\cancel{\lambda}} \cdot \frac{\cancel{\lambda}}{\cancel{2}} = \pi$$

Quando siamo in cond. di max $E = E_0 \Rightarrow \cos\varphi = 1$;

Aumento di π la fase (per vedere l'effetto della riflessione) $\varphi = 2\pi m$ $m = 0, \pm 1, \pm 2 \dots$

$$E = E_0 \cos(2\pi m + \pi) = -E_0$$

Interferenza da lamine sottili



Raggio 2:

Riflessione da mezzo ottic. meno denso a mezzo ott. più denso

$$\varphi_2 = \pi$$

Raggio 2':

1) Cammino in più $2t$

$$\Delta\varphi = \frac{2\pi}{\lambda_n} \cdot 2t = \frac{4\pi t}{\lambda_n}$$

2) Riflessione da mezzo più denso a mezzo meno denso

$$\Delta\varphi = 0$$

$$\Delta\varphi_{TOT} = \pi - \frac{4\pi t}{\lambda_n}$$

Condizioni di max se

$$\Delta\varphi_{TOT} = 2\pi m \qquad m = 0, \pm 1, \pm 2$$

$$2\pi m = \pi - \frac{4\pi t}{\lambda_n}; \quad 2m = 1 - \frac{4t}{\lambda_n};$$

$$\frac{4t}{\lambda_n} = 1 - 2m$$

$$\lambda_n = \frac{4t}{1-2m}$$

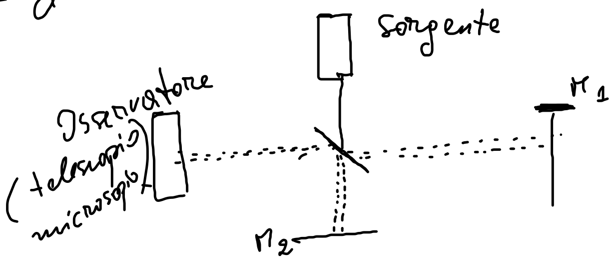
Se $\Delta\varphi_{TOT} = \pi + 2\pi m$ cond. di minimo

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

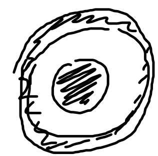
$$\cancel{1} - \frac{4t}{\lambda_n} = \cancel{1} + 2m;$$

$$\lambda_n = -\frac{\overset{2}{\cancel{4}}t}{2m} = -\frac{2t}{m} \qquad m = \pm 1, \pm 2$$

Interferometro di Michelson

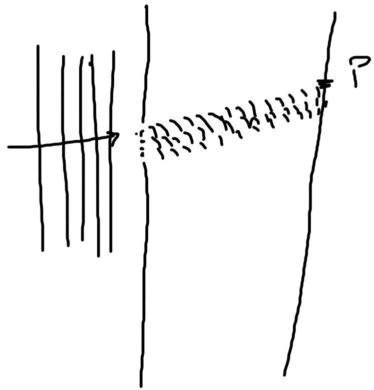


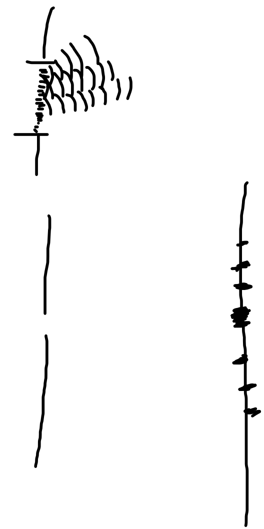
M_1, M_2: specchi tot. rifl.

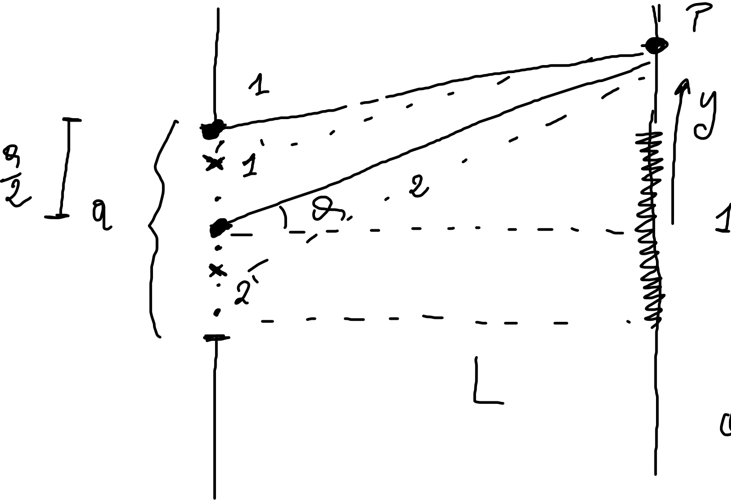


$\Delta d = N\lambda$; $\lambda = \frac{\Delta d}{N}$

Diffrazione







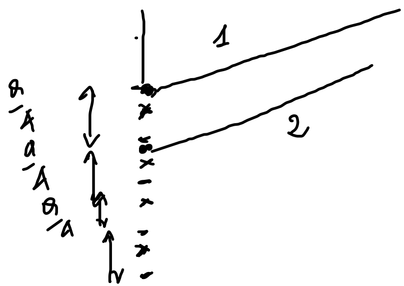
Primo punto di buio?

$\delta = \frac{a}{2} \operatorname{sen}\theta$

1 e 2 in interf. distr. se

$\frac{a}{\cancel{2}} \operatorname{sen}\theta = \frac{\lambda}{\cancel{2}}$; $\operatorname{sen}\theta = \pm \frac{\lambda}{a}$

Anche 1' e 2' in interf. distr. se lo sono 1 e 2



$\delta = \frac{a}{4} \operatorname{sen}\theta$

Se $\frac{a}{4} \operatorname{sen}\theta = \frac{\lambda}{2}$ interf. distr. tra 1 e 2

$\frac{a}{2} \operatorname{sen}\theta = \lambda$; $\operatorname{sen}\theta = \frac{2\lambda}{a}$

$$\operatorname{sen}\vartheta_{buio} = \frac{m\lambda}{a} \qquad m = \pm 1, \pm 2, \pm 3 \ldots$$

Punti di buio

$\vartheta \ll 1$

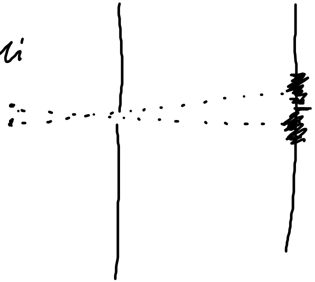
$$\operatorname{sen}\vartheta \sim \vartheta \sim \operatorname{tg}\vartheta \qquad \operatorname{tg}\vartheta = \frac{y}{L} \sim \vartheta \sim \operatorname{sen}\vartheta$$

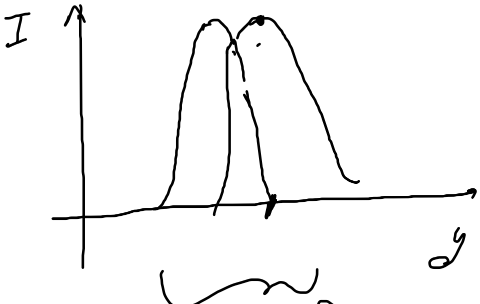
$$\frac{y_{buio}}{L} = \frac{m\lambda}{a} \; ; \qquad y_{buio} = m\frac{\lambda}{a}L \qquad \Delta y_{buio} = \frac{\lambda L}{a}$$

Per vedere bene : $\frac{\lambda}{a} \approx 1$

Se $\lambda \ll a$: $\Delta y_{buio} \approx 0$

Criterio di Rayleigh :





somma

Fenditura rettangolare

$\sin\theta_{min} = \frac{\lambda}{a}$

Fenditura circolare

$\sin\theta_{min} \cong 1.22\frac{\lambda}{a}$