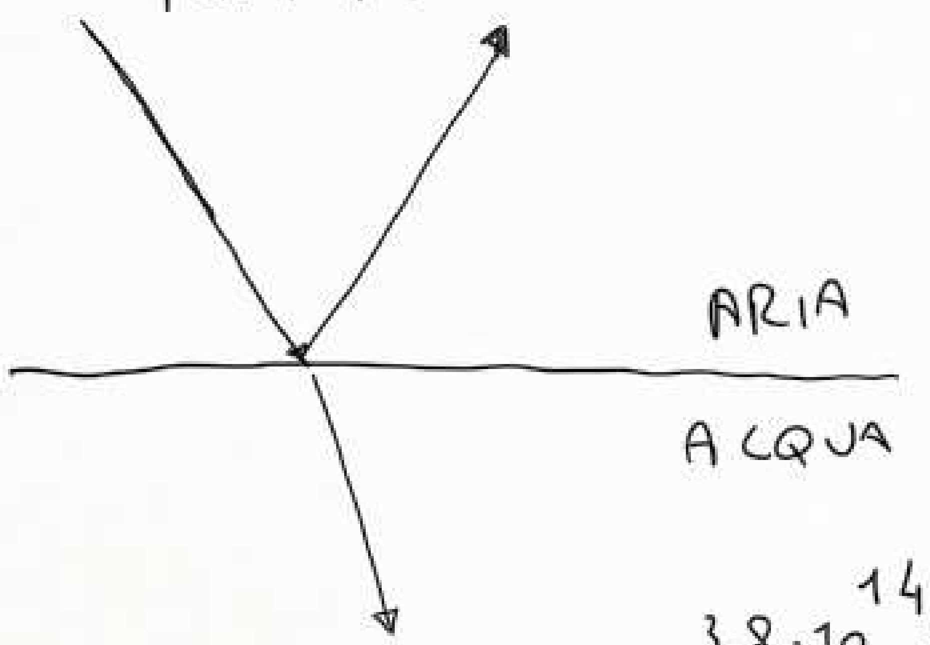
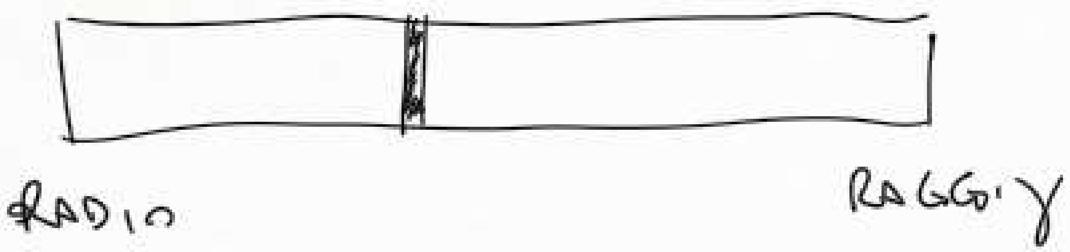
RIFRAZIONE E RIFLESSIONE



VISIBILE $3.8 \cdot 10^{14} \le \nu \le 7.9 \cdot 10^{14}$ Hz

LUCE $0.78 \cdot 10^{-6} \ge \lambda \ge 0.38 \cdot 10^{-6}$ m



le onde nel vuoto hanno c

" nel mezzo hanno v

$\frac{c}{v} \equiv n$ INDICE DI RIFRAZIONE

$n \geq 1$

$n \approx 1$ ARIA

1.33 ACQUA

1.5 - 2 VETRO

$v = \lambda \nu$, $c = \lambda_0 \nu \Rightarrow$

$\lambda = \dfrac{\lambda_0}{n} \Rightarrow k = n k_0$

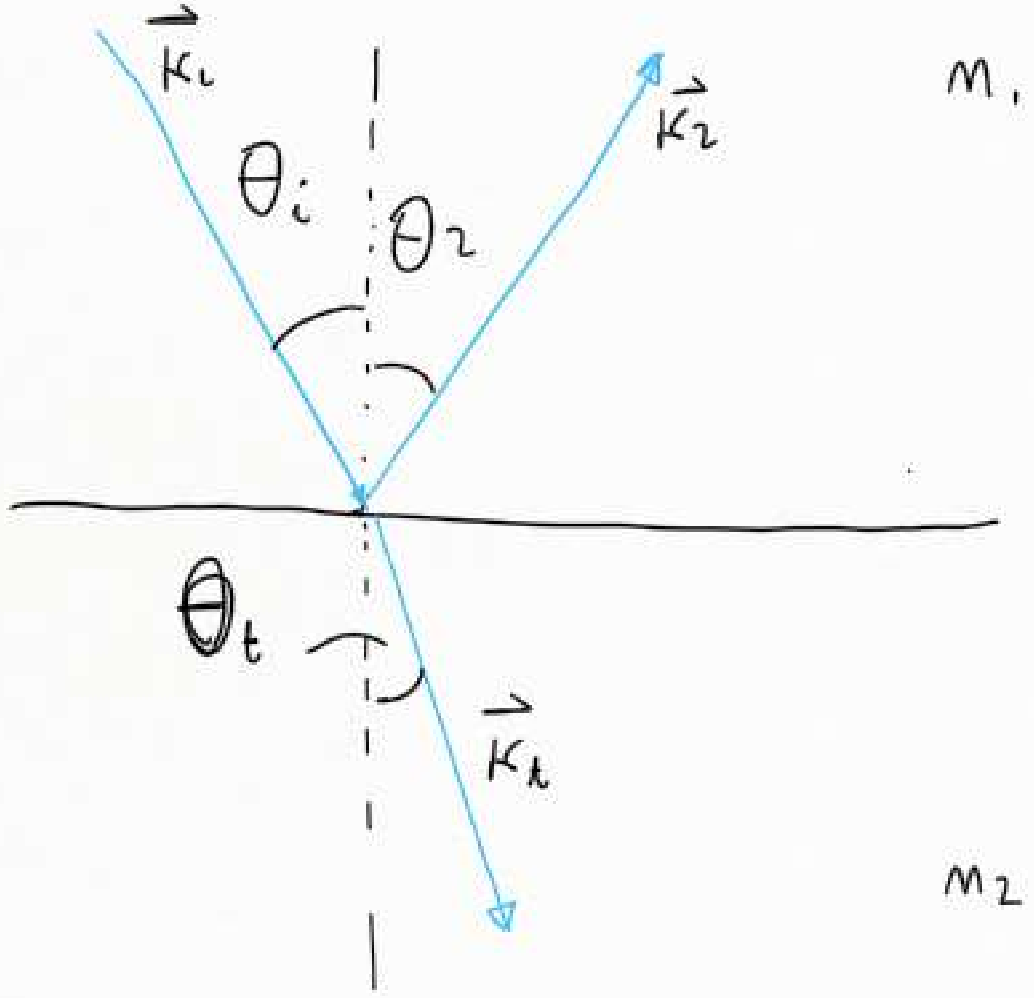
- piano di incidenza:

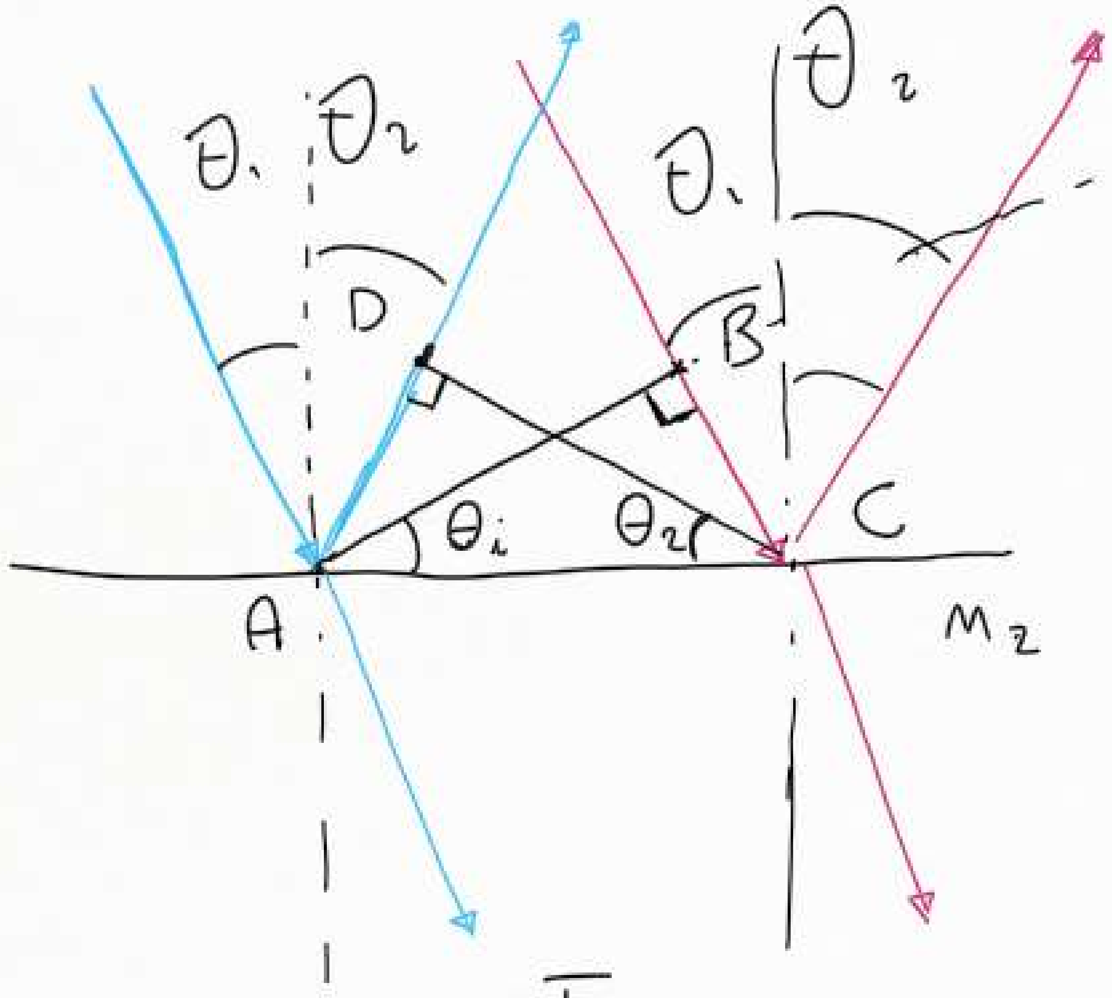
il piano formato da $\vec{k}_i$ e dalla normale

- superficie speculare

$\downarrow$

$\vec{k}_r$, $\vec{k}_t$ giacciono sul piano d'incidenza





$$\Downarrow$$

$$\theta_i = \theta_r$$

$\overline{AD} = \overline{BC}$

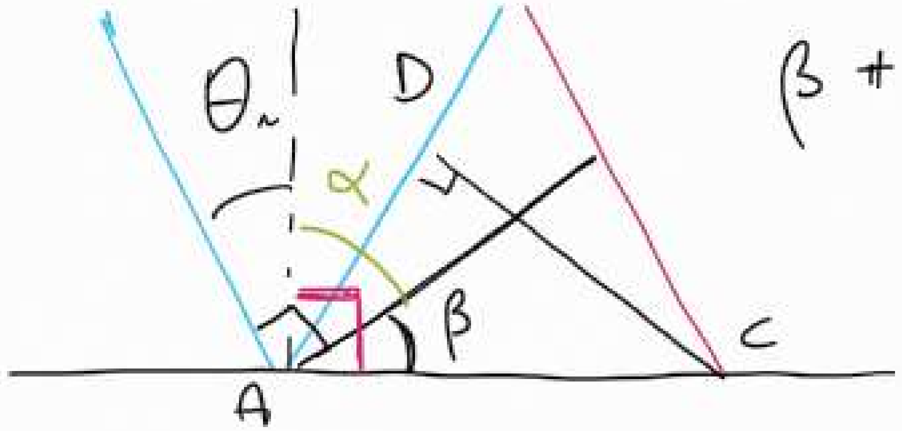
consideriamo ACD e ABC

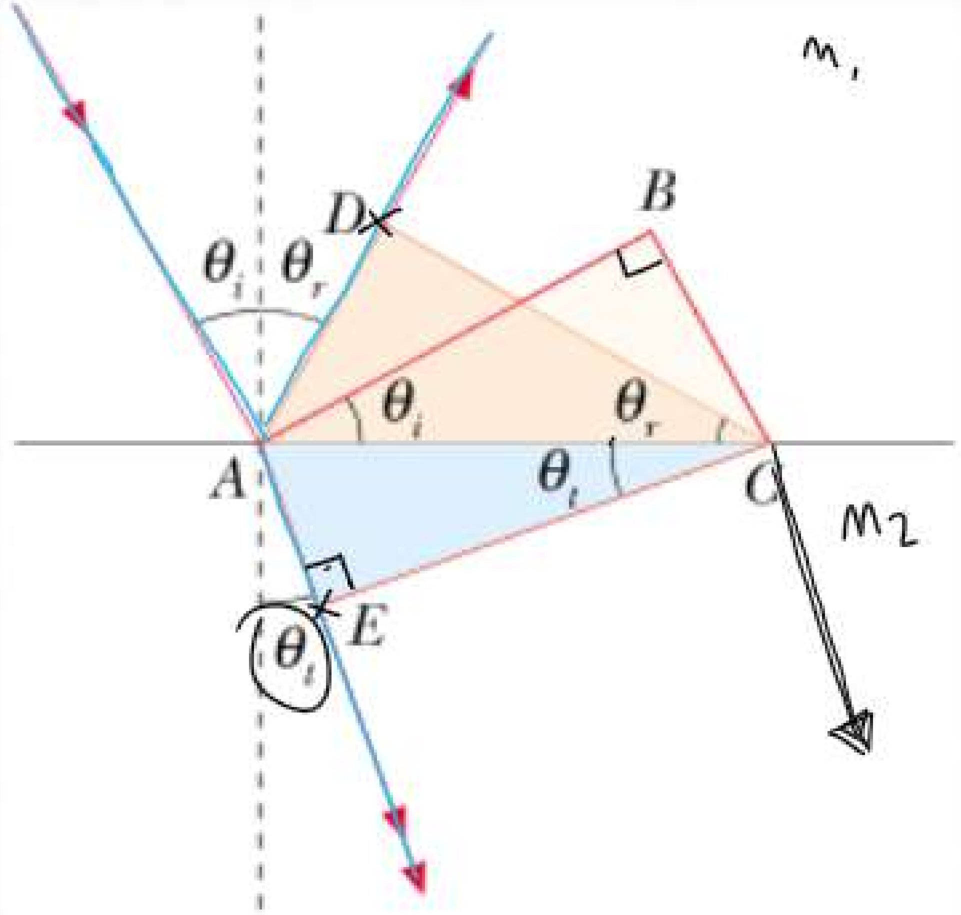
- hanno AC in comune
- hanno un altro lato uguale ($\overline{AD} = \overline{BC}$)
- hanno un angolo retto

$$\Downarrow$$

i due triangoli hanno <u>tutti</u> i lati e angoli uguali

$$\left.\begin{aligned} \theta_i + \alpha &= \frac{\pi}{2} \\ \beta + \alpha &= \frac{\pi}{2} \end{aligned}\right\} \Rightarrow \beta = \theta_i$$





consideriamo ABC e ACE

↳ hanno un lato in comune (AC): l'ipotenusa

$$\overline{AE} = v_2 \Delta t = \frac{c}{n_2}\Delta t = \overline{AC}\sin\theta_t \Rightarrow$$

$$\overline{AC} = \frac{c\Delta t}{n_2 \sin\theta_t}$$

$$\overline{BC} = v_1 \Delta t = \frac{c}{n_1}\Delta t = \overline{AC}\sin\theta_i \Rightarrow$$

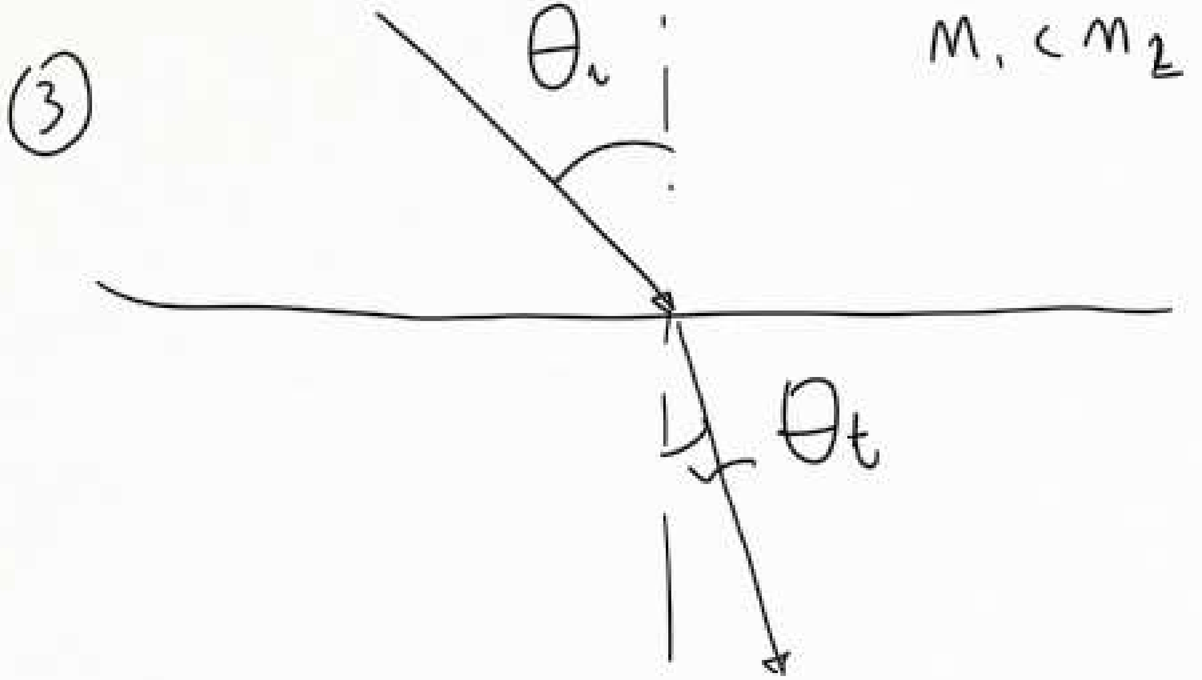
$$\overline{AC} = \frac{c\Delta t}{n_1 \sin\theta_i} \Rightarrow$$

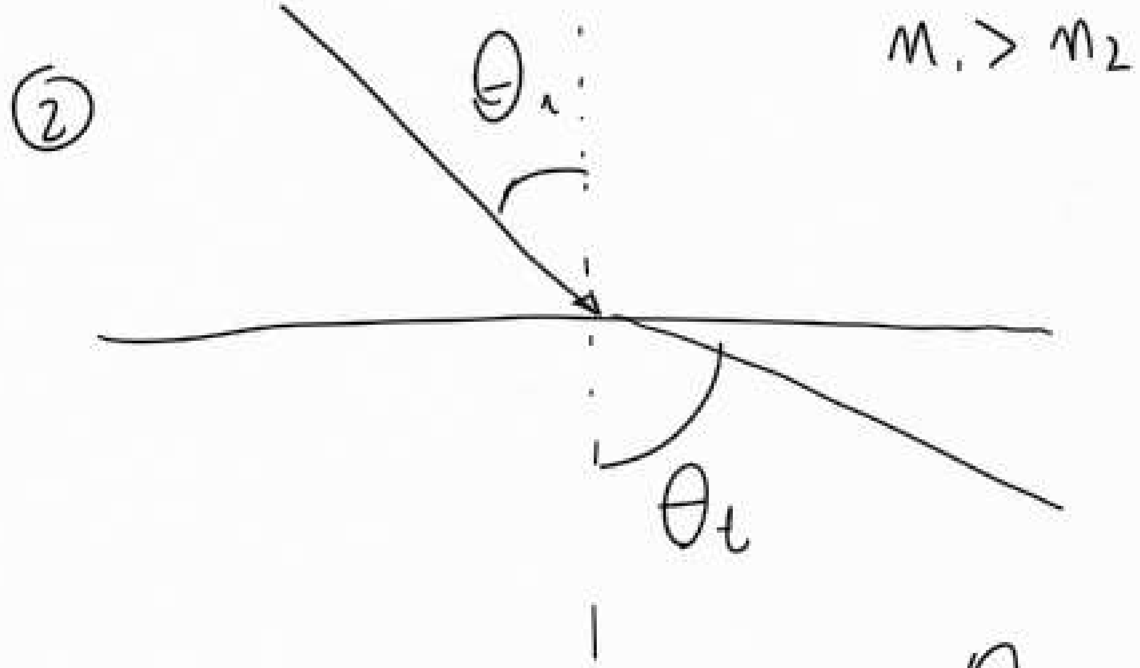
$$\frac{c\Delta t}{n_2 \sin\theta_t} = \frac{c\Delta t}{n_1 \sin\theta_i} \Rightarrow n_1 \sin\theta_i = n_2 \sin\theta_t$$

LEGGE DI SNELL

$$\sin\theta_t = \frac{n_1}{n_2}\sin\theta_i$$

1. se $\theta_i = 0$, $\theta_t = 0$
2. se $n_1 > n_2$, $\theta_t > \theta_i$
3. se $n_2 > n_1$, $\theta_i > \theta_t$

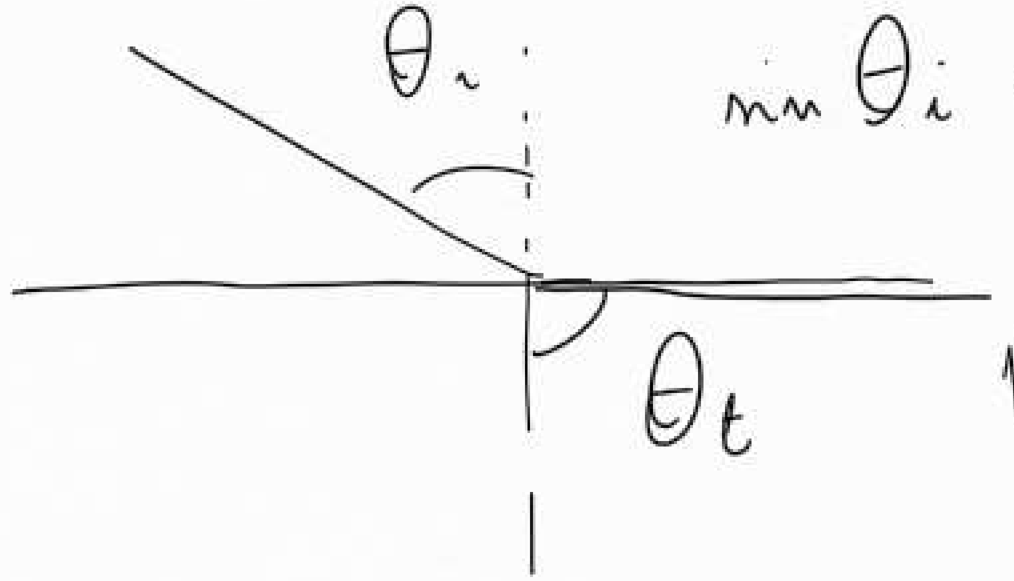




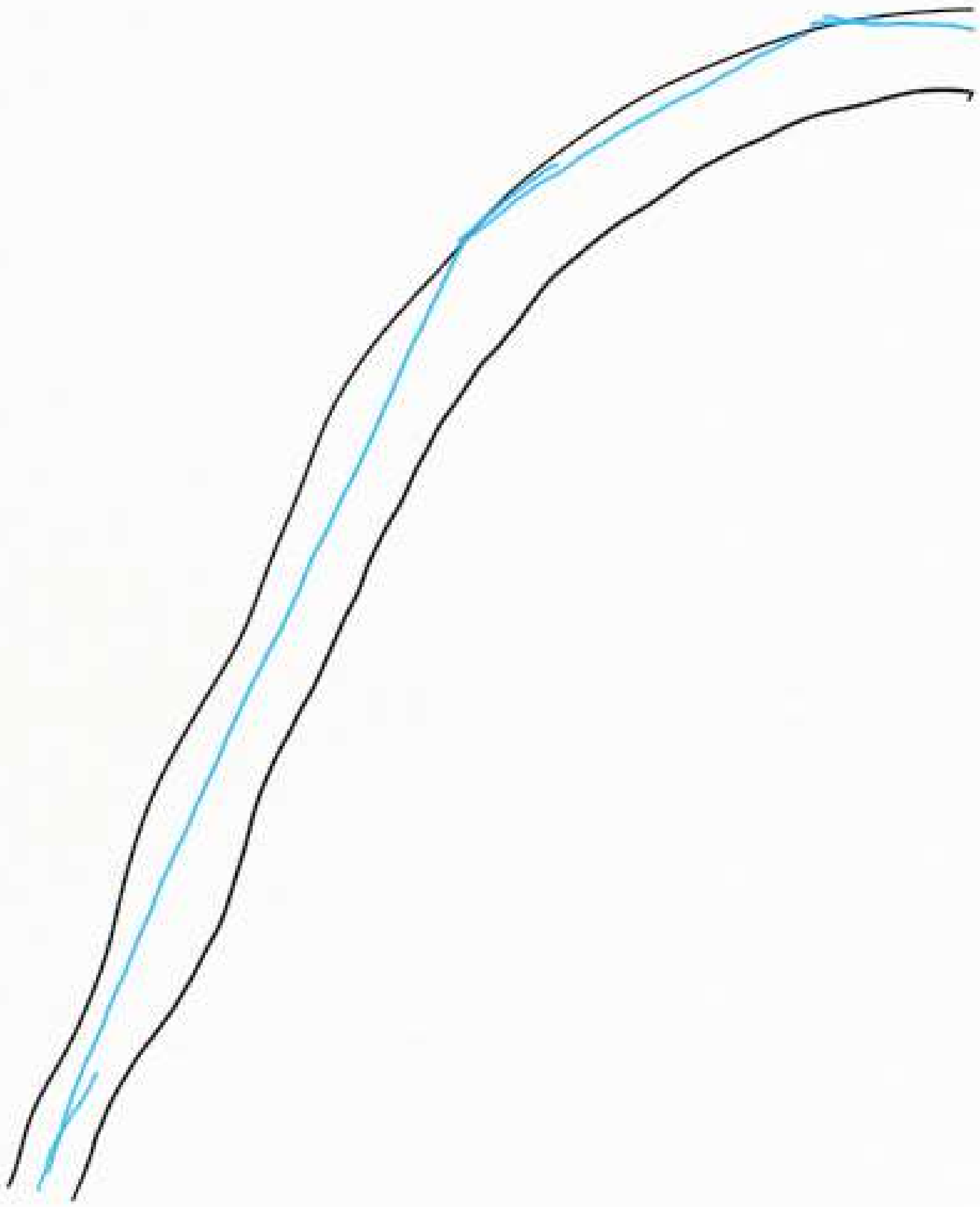
$$\sin\theta_t = 1 = \frac{n_1}{n_2}\sin\theta_i \Rightarrow$$

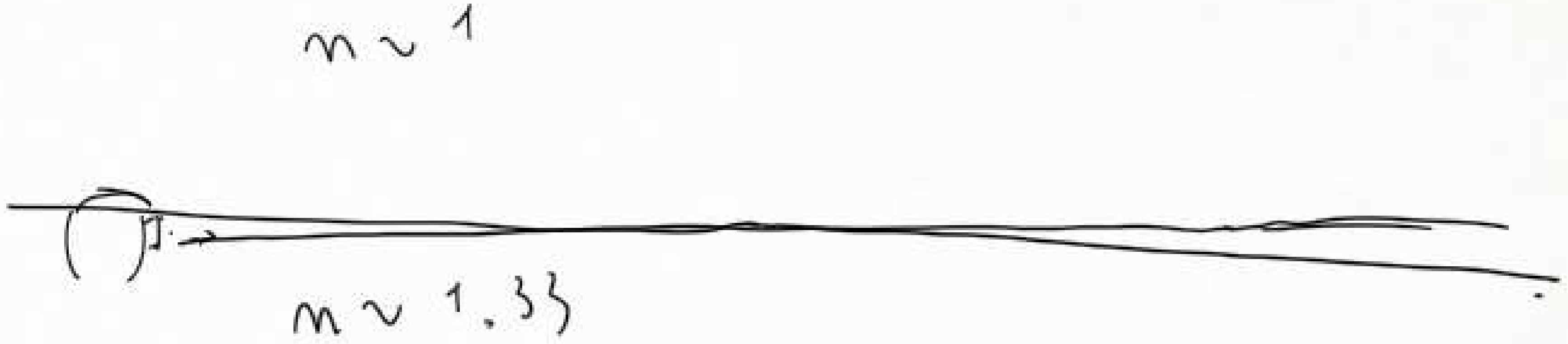
$$\sin\theta_i = \frac{n_2}{n_1} \equiv \sin\theta_0$$

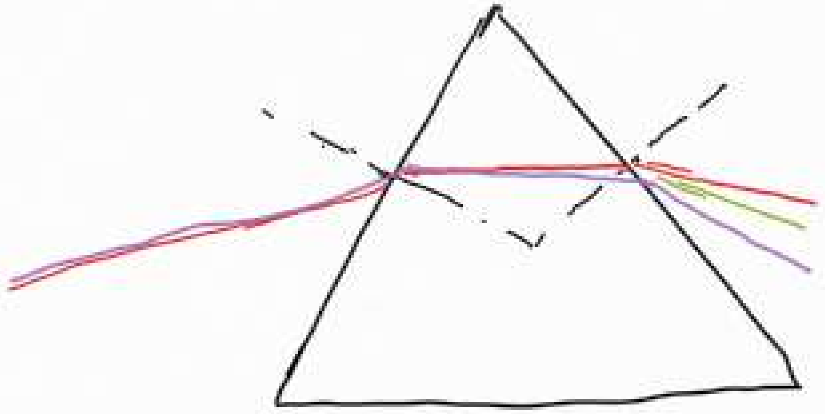
ANGOLO LIMITE



per $\theta_i > \theta_0$



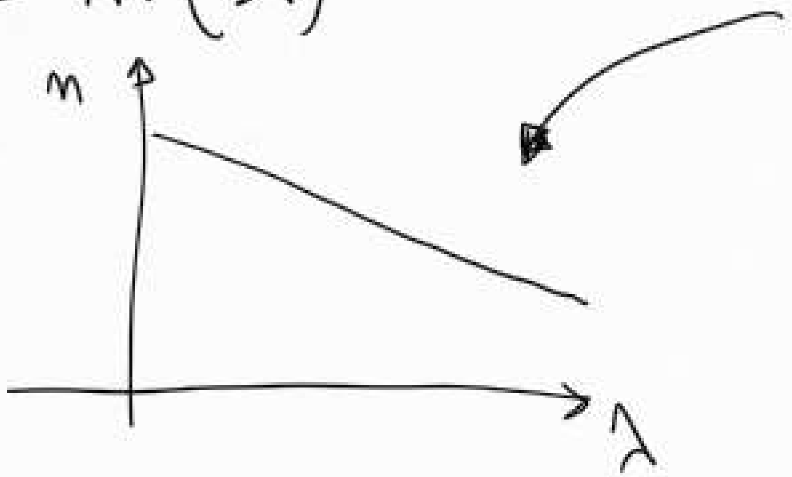

n ~ 1
n ~ 1.33



DISPERSIONE

DELLA LUCE

$$n = n(\lambda)$$



$$E(r,t) = E_0(r)\cos(kr - \omega t)$$

$$P_m(r) = I(r)\,4\pi r^2 = \frac{1}{2} c\varepsilon_0 E_0^2(r)\,4\pi r^2 = \text{cost} \mapsto$$

$$E_0^2(r)\,r^2 = \text{cost} \mapsto E_0(r) \sim \frac{1}{r} \mapsto$$

$$\begin{cases} E(r,t) = \dfrac{E_0}{r}\cos(kr - \omega t) \\ B(r,t) = \dfrac{E_0}{cr}\cos(kr - \omega t) \end{cases}$$

ONDA E.M. SFERICA

stessa λ e ω

$$E_1 = \frac{E_0}{r_1}\cos(kr_1 - \omega t + \phi_1)$$

$$E_2 = \frac{E_0}{r_1}\cos(kr_2 - \omega t + \phi_2)$$

differenza di fase

$$\delta = (kr_2 - \omega t + \phi_2) - (kr_1 - \omega t + \phi_1) =$$

$$= \boxed{k(r_2 - r_1)} + \phi_2 - \phi_1 = k(r_2 - r_1) + \Delta\phi$$

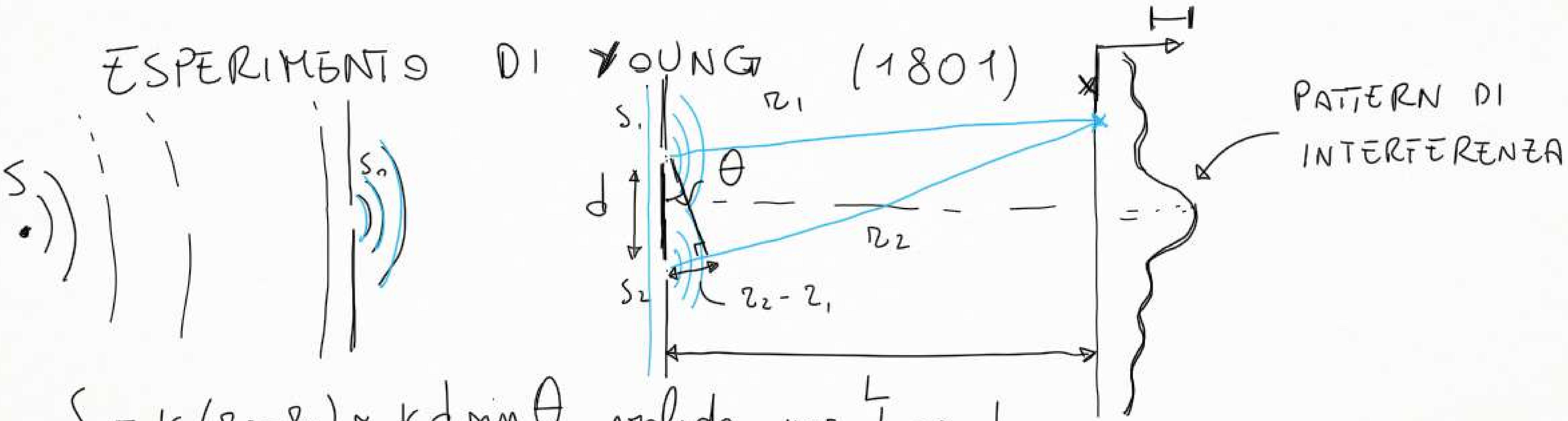
differenza di fase intrinseca

$\Delta\phi$ non dipende dal tempo $\rightarrow$ le sorgenti sono coerenti

↳ possono dare interferenza

se $\Delta\phi = 0$ $\rightarrow$ le sorgenti sono sincrone

ESPERIMENTO DI YOUNG (1801)



$\delta = k(r_2 - r_1) \approx k d \sin\theta$ valida per $L \gg d$

$k d \sin\theta = \boxed{\frac{2\pi}{\lambda} \sin\theta}$

$I(\theta) = 4 I_0 \cos^2\left(\frac{\pi d \sin\theta}{\lambda}\right)$, I_0 è l'intensità della singola onda

$$I(\theta) = 4 I_0 \cos^2\left(\frac{\pi d \sin\theta}{\lambda}\right)$$

massimo se

$$\frac{\pi d \sin\theta}{\lambda} = m\pi \implies \boxed{d \sin\theta = m\lambda}$$ con m intero

minimo se

$$\frac{\pi d \sin\theta}{\lambda} = \pi\left(m + \frac{1}{2}\right) \implies \boxed{d \sin\theta = \left(m+\frac{1}{2}\right)\lambda}$$ m intero