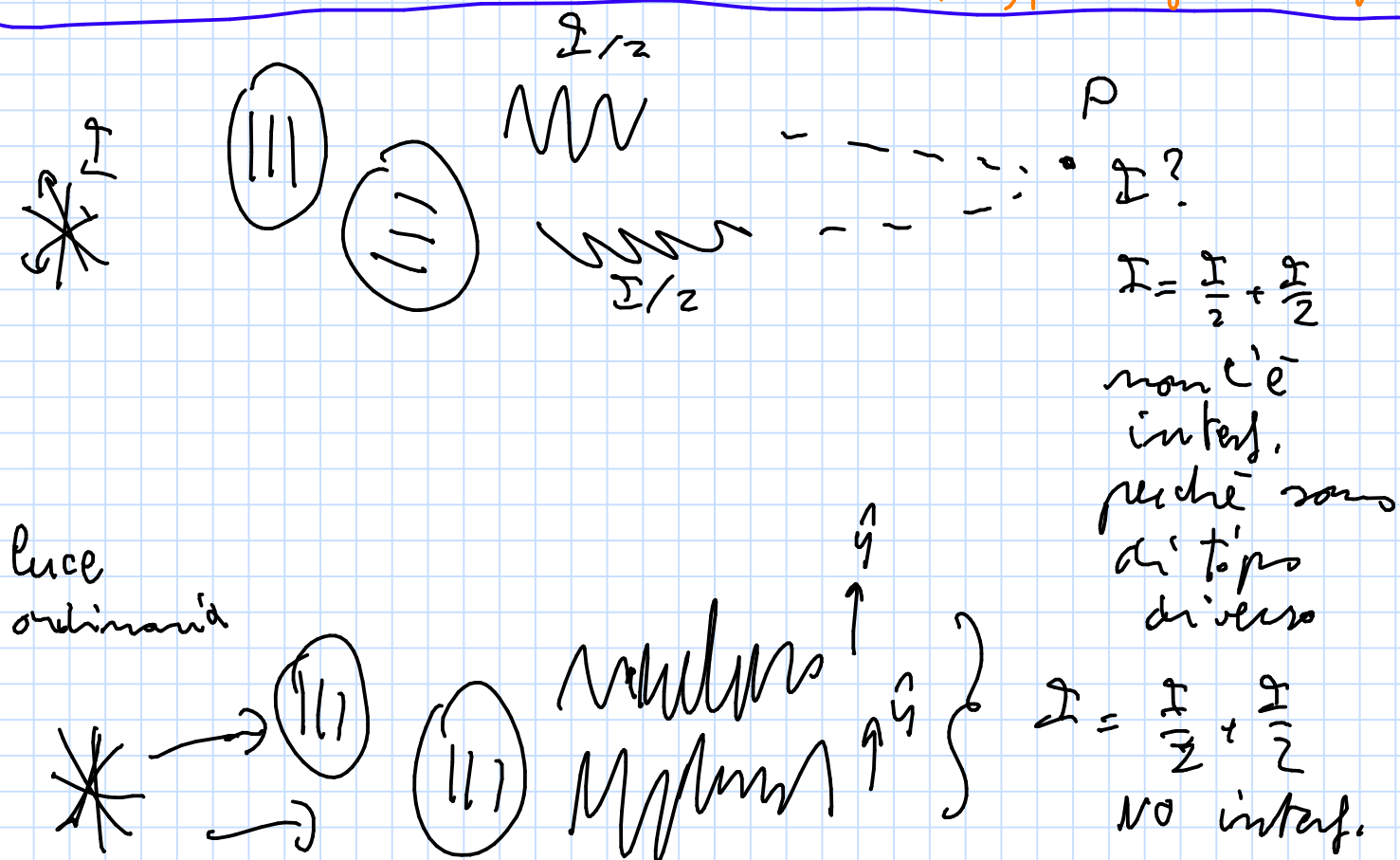
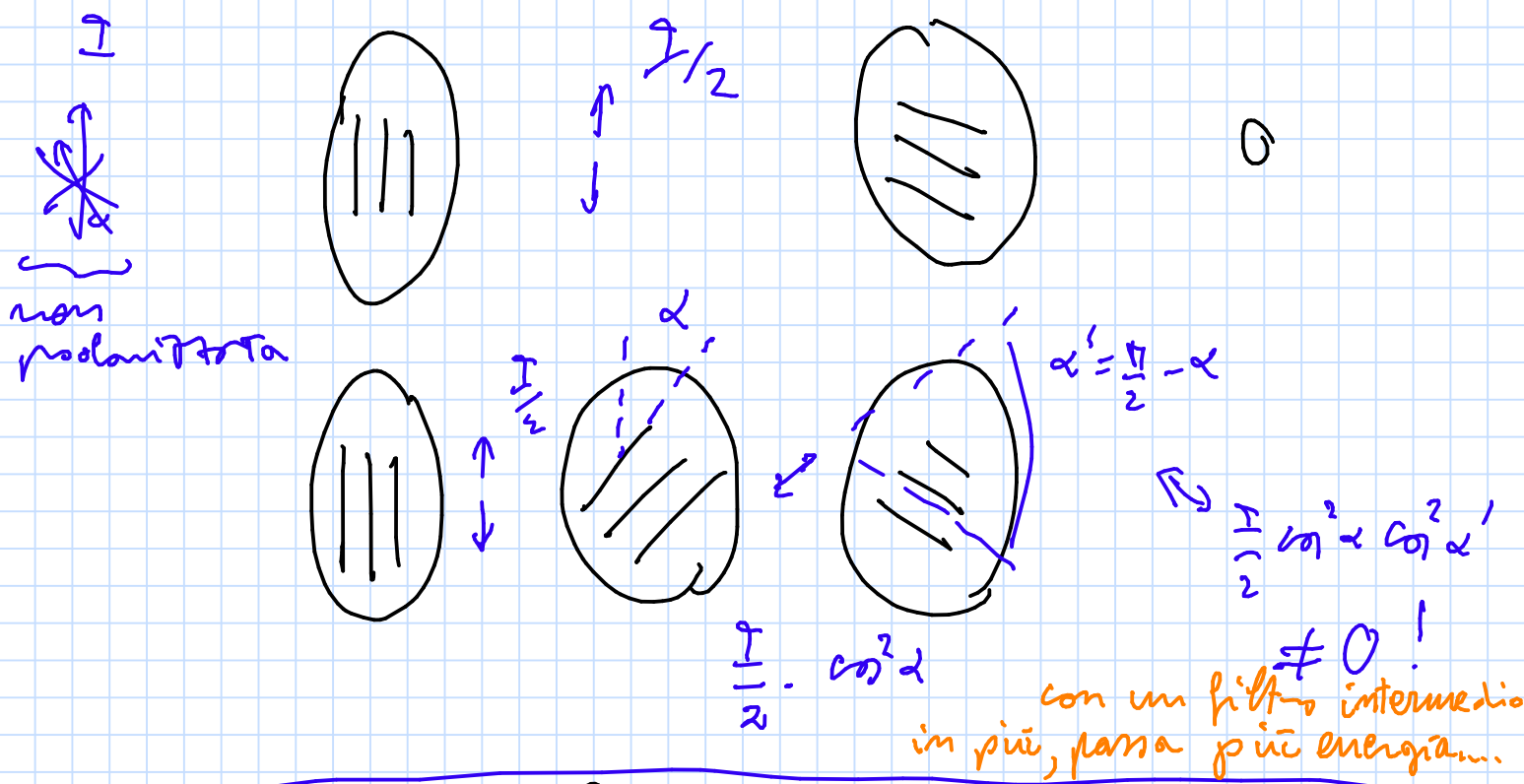
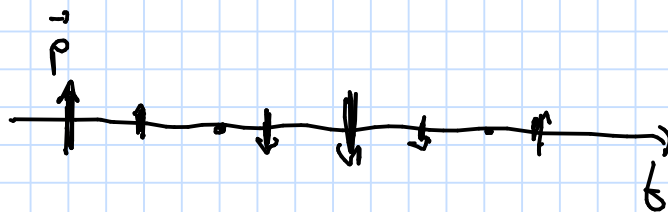
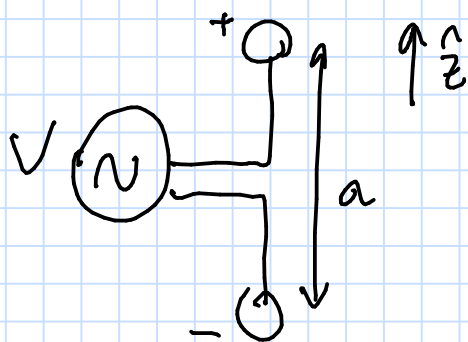


Effetto peculiare dei polarizzatori

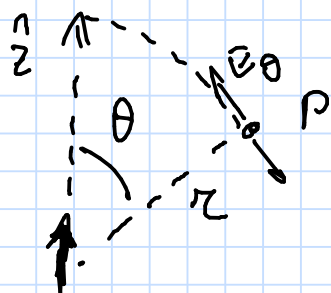


interferenza solo da onde coerenti'

Dipolo elettrico oscillante



$q = q_0 \sin \omega t \Rightarrow \vec{p}(t) = q a \sin \omega t \hat{z} = p_0 \sin \omega t \hat{z}$
 campo $\vec{E}$ generato da d. oscillante



$\propto \vec{p}$ fase identica
 $\vec{E} \sim \frac{1}{r^3}$

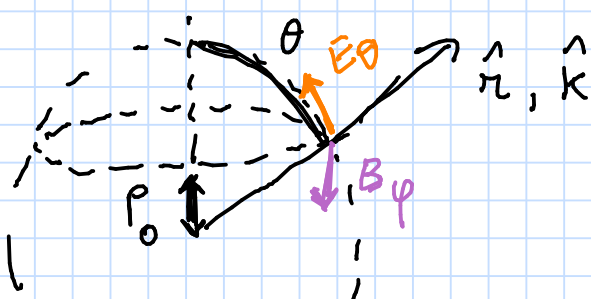
oscillante : $\vec{E}_r = 0$, $E_\varphi = 0$

$$E_\theta = \underbrace{\frac{p_0}{4\pi \epsilon_0} \left(\frac{\omega}{c}\right)^2}_{\text{costante} \sim \omega^2} \cdot \frac{\sin \theta}{r} \sin(kr - \omega t)$$

$\uparrow$
onda sferica

o. sferica non isotropa, dip. da θ

$$E_\theta = \frac{\pi p_0}{\epsilon_0} \frac{1}{\lambda^2} \frac{\sin \theta}{r} \sin(\dots)$$



E_θ lungo meridiani

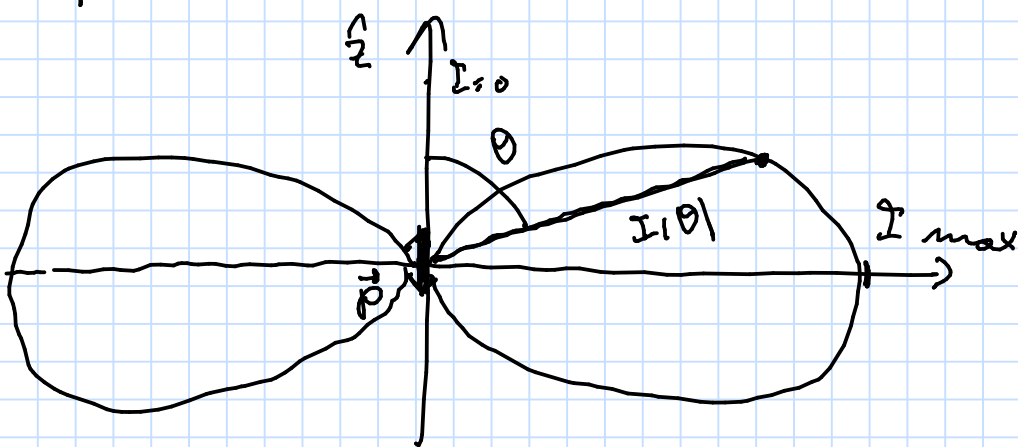
$$\vec{B}_\varphi \perp \vec{E}_\theta \perp \hat{k}, \hat{r}$$

$$I(r, \theta) = \frac{1}{2} \epsilon_0 c E_0^2 = \boxed{\frac{P_0^2}{32 \pi^2 \epsilon_0 c^3} \omega^4} \frac{\sin^2 \theta}{r^2}$$

$\uparrow$
 $E_\theta = E_0$ I_0 $\uparrow$
 $\Delta [I_0] = W \propto (\text{frequenza})^4$

$\frac{1}{r^2}$ è l'area dip. che c'era per onde sferiche isotrope

qui modulata $\sin^2 \theta$



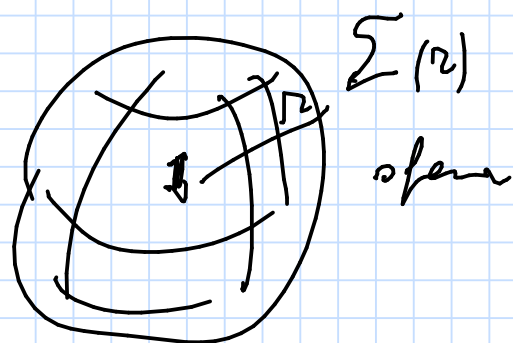
$$I(\theta) = I(r, \theta)$$

con r fissato

antenne sono esempi di d. oscillanti

potenza

$$P = \int I(\theta) d\Sigma$$



$$I_0 = \frac{P_0^2 \omega^4}{32 \pi^2 \epsilon_0 c^3}$$

$$P = \frac{I_0}{r^2} \oint_{\Sigma} \sin^2 \theta d\Sigma$$

$$= \frac{P_0^2 \omega^4}{12 \pi \epsilon_0 c^3} = \frac{8\pi}{3} I_0$$

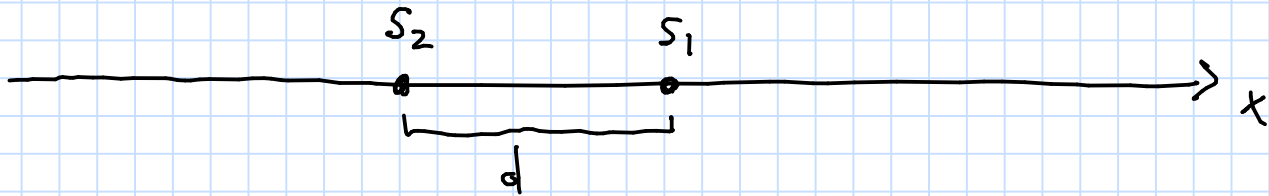
$$\int_0^\pi d\theta \int_0^{2\pi} d\varphi (\sin \theta) \sin^2 \theta = 2\pi \int_0^\pi \sin^3 \theta d\theta$$

$$= 2\pi \frac{4}{3}$$

$$P \propto \omega^4$$

Antenne direzionali : sfruttiamo interferenza
per convogliare I in
una direzione

esempio: S_1 e S_2 coerenti $\left\{ \begin{array}{l} I \text{ max in dir } \hat{x} \\ I \text{ minima } -\hat{x} \end{array} \right.$



soluzione: $\left\{ \begin{array}{l} d = \frac{\lambda}{4} \\ S_1 : E_0 e^{i\omega t + \phi} \\ S_2 : E_0 e^{i\omega t} \end{array} \right.$

d'onda partita da S_2 ha accumulato una
fase $\delta = K \cdot d = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{4} = \frac{\pi}{2}$

occhio: S_1 in ritardo risp. S_2 tale che $e^{i(Kd - i\omega t)} = e^{i(\omega t - \phi)}$

scegliamo $\phi = -\frac{\pi}{2}$ per avere onde in fase di S_1 e S_2
che si propagano verso $+\hat{x}$

$\Rightarrow$ Interf. costruttiva

I totale

dip. dal tipo di onde

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \underbrace{\cos \delta}_{\substack{1 \\ \text{max in fase } \delta=0}}$$

nella dir $-\hat{x}$: su S_2 arriva da S_1 onda con

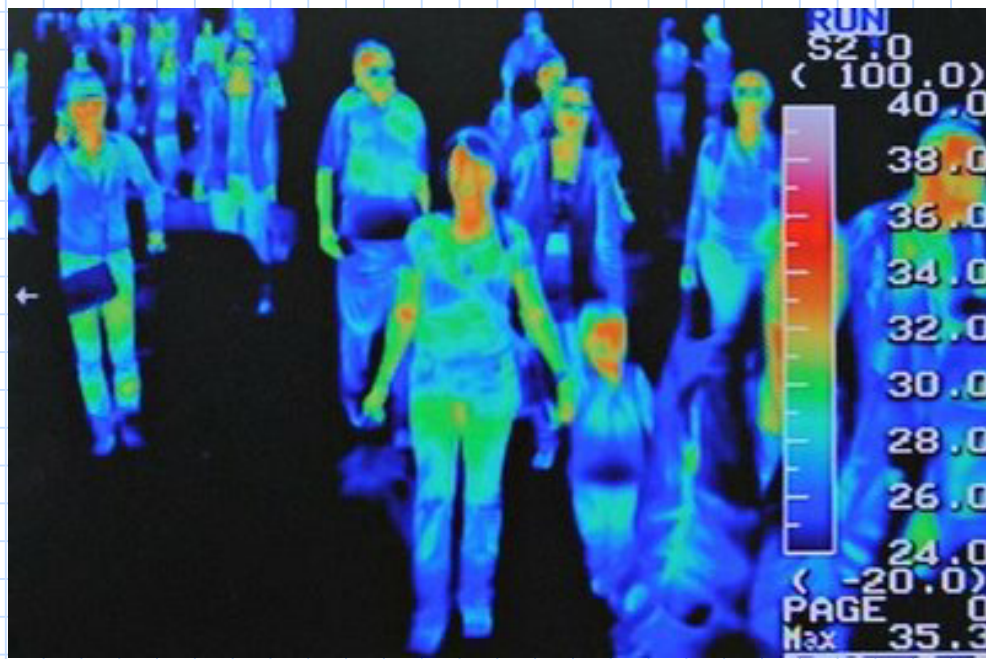
fase $\delta = Kd + \phi = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{4} + \frac{\pi}{2} = \frac{\pi}{2} + \frac{\pi}{2} = \pi$

$\Rightarrow$ interferenza (compl.) distruttiva

pag. 600

↪ 15.7, 15.8

altri
esempi



infrarosso