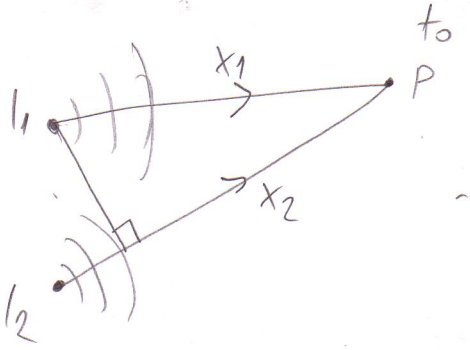
INTERFERENCIJA VALOVA SVJETLOSTI, KOHERENTNI IZVORI



- superpozicija valova E_1 i E_2

- interferencija svjetlosti nastaje kada se 2 vala istovremeno nađu u istoj točki prostora

- za koherentne izvore vrijedi: razlika faza valova je vremenska konstanta

$$E_1(t_0, x_1) = E_0 \cos(\omega t_0 - k_1 x_1) = E_0 \cos\left[\omega\left(t_0 - \frac{k_1}{\omega} x_1\right)\right]$$

$$= E_0 \cos\left[\omega\left(t_0 - \frac{1}{v_1 k} x_1\right)\right] = E_0 \cos\left[\omega\left(t_0 - \frac{x_1}{v_1}\right)\right]$$

$$= E_0 \cos\left[\omega\left(t_0 - \frac{n_1}{c} x_1\right)\right]$$

- isto tako za E_2: $E_2(t_0, x_2) = E_0 \cos\left[\omega\left(t_0 - \frac{n_2}{c} x_2\right)\right]$

- rezultantni val:

$$E(t_0, x) = \vec{E_1}(t_0, x_1) + \vec{E_2}(t_0, x_2)$$

$$= E_0 \cos\left[\omega\left(t_0 - \frac{n_1}{c} x_1\right)\right] + E_0 \cos\left[\omega\left(t_0 - \frac{n_2}{c} x_2\right)\right]$$

$$= 2E_0 \cos\left[\frac{\omega}{2c}(n_1 x_1 - n_2 x_2)\right] \cos\left[\omega t_0 - \frac{\omega}{2c}(n_1 x_1 + n_2 x_2)\right]$$

- faza valova $\Delta\phi = \frac{\omega}{c}(n_1 x_1 - n_2 x_2) = \frac{2\pi}{\lambda}(n_1 x_1 - n_2 x_2) = \frac{2\pi}{\lambda}\delta$

gdje je δ - optička razlika hoda $\delta = n_1 x_1 - n_2 x_2$

- za valove koji prolaze istim sredstvom vrijedi:

$$\delta = n(x_1 - x_2) = n\Delta$$

- amplituda rezultantnog vala

$$E_{0rez} = 2E_0 \cos\left[\frac{\omega}{2c}(n_1x_1 - n_2x_2)\right] - 2E_0 \cos\left(\frac{\Delta\phi}{2}\right)$$

$$\cos\left(\frac{\Delta\phi}{2}\right) = \begin{cases} \pm 1 & - \text{ max intenzitet} \\ 0 & - \text{ min} \end{cases}$$

max intenzitet: $\cos\left(\frac{\Delta\phi}{2}\right) = \pm 1 \iff \frac{\Delta\phi}{2} = m\pi$, $m = 0, \pm 1, \pm 2, \ldots$

odnosno $\frac{1}{2}\frac{2\pi}{\lambda}\delta_{max} = m\pi$

$$\boxed{\delta_{max} = m\lambda}$$

min intenzitet:

$\cos\left(\frac{\Delta\phi}{2}\right) = 0 \iff \frac{\Delta\phi}{2} = (2m+1)\frac{\pi}{2}$, $m = 0, \pm 1, \pm 2, \ldots$

odnosno $\frac{1}{2}\frac{2\pi}{\lambda}\delta_{min} = (2m+1)\frac{\pi}{2}$

$$\boxed{\delta_{min} = (2m+1)\frac{\lambda}{2}}$$