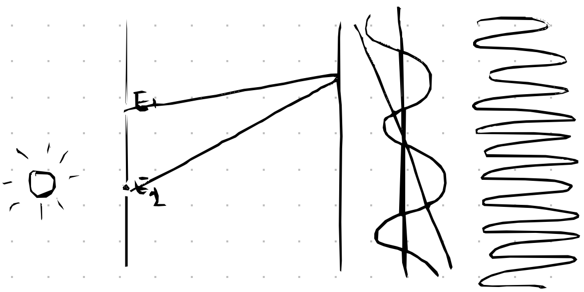
# Interferencija svjetlosti

< konstruktivna ili destruktivna

tehnička realizacija dva koherentna izvora




ovako izgleda

$$E_1 = E_0 \sin(\omega t - k x_1)$$

$$E_2 = E_0 \sin(\omega t - k x_2)$$

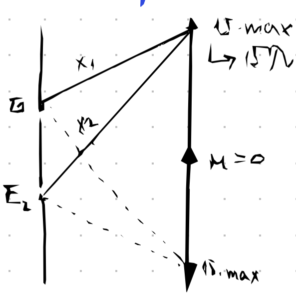
$$E = E_1 + E_2$$

$\Longrightarrow$ max. $|x_1 - x_2| = m\lambda \qquad m = 0, 1, 2 \ldots$

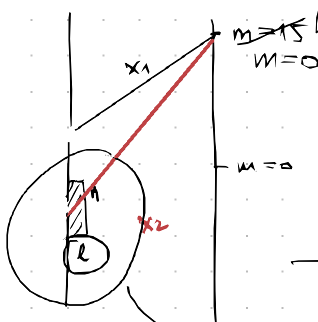
$$|x_1 - x_2| = \frac{2m+1}{2}\lambda$$

$$|n_1 x_1 - n_2 x_2| =$$

## Zadatak: Youngov pokus




prije




tu je sada nulti max

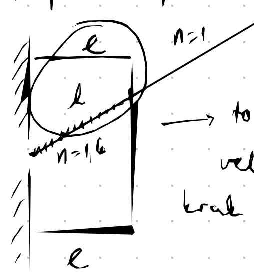
poslije

$\lambda = 500\,nm$

$n = 1{,}6$

$l = ?$ - debljina listića

→ prva aproksimacija (bez nje nema ni :)




→ to su toliko male veličine da je krak svjetlosti ~ l

$$|x_2 - x_1| = 15\lambda$$

$$x_2 - l + n\cdot l - x_1 = m\cdot\lambda = 0$$

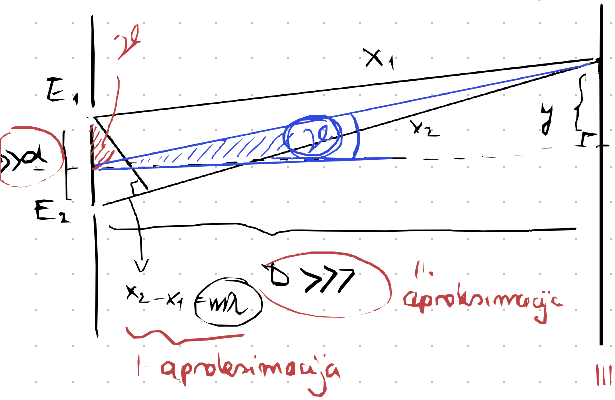
$$15\lambda - l + n\,l = 0$$

$$15\lambda - l(1-n) = 0$$

$$l = \left|\frac{-15\lambda}{n-1}\right| \Rightarrow l = \frac{15\lambda}{n-1} = 1{,}25\times10^{-5}\,m$$

jer je simetrično pa je 15. max i ondje gdje je $x_2$ kraći → to smo trebali

# Ekvidistantnost u Youngovom pokusu:




$m\lambda$; kako izraziti $y(m\lambda) = ?$

$$\sin\vartheta = \frac{m\lambda}{d}$$

$$\tan\vartheta = \frac{y}{D}$$

$\vartheta \to 0$ ; jer su velike udaljenosti između zaslona, a ne između rupa

III. aproksimacija

$$\frac{m\lambda}{d} \simeq \frac{y}{D} \Leftarrow \begin{cases} \vartheta \to 0 \Rightarrow \sin\vartheta \simeq \vartheta \\ \tan\vartheta \simeq \vartheta \end{cases}$$

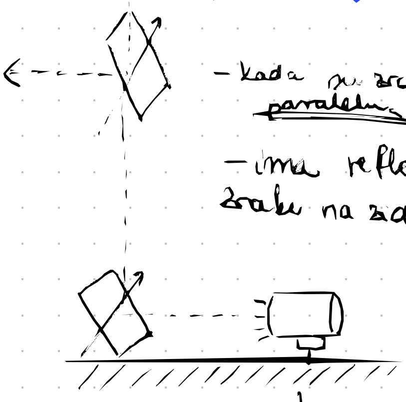
$$\boxed{y = \frac{D}{d} \cdot m\lambda} \quad \text{MAX}$$

$$\boxed{y = \frac{D}{d} \cdot \frac{2m+1}{2}\lambda} \quad \text{MIN}$$

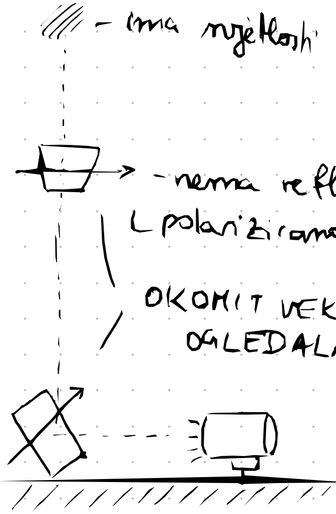

IV. aproksimacija – ono sa lisičkom prije

# RATKO POKUSI

## 1. Linearno polariziranje svjetlosti




- kada su zrcala paralelna
- ima reflektirane zrake na zidu



- ima svjetlosti na stropu
- nema refleksije
  L polarizirano je

OKOMIT VEKTORI OGLEDALA = 90°

## 2. Drugi pokus polariziranja

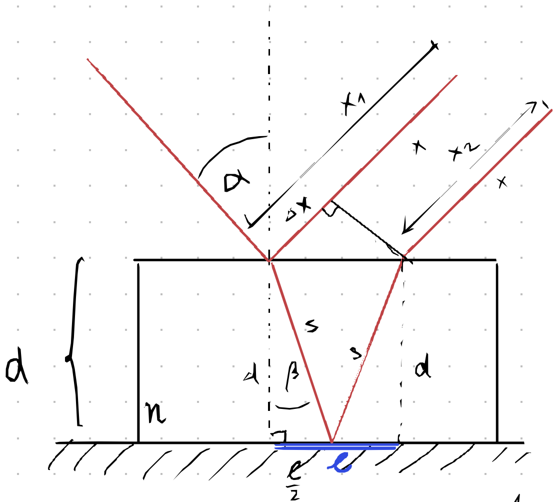
- 1. (žuti) polarizator je poklopljen na 0°; 0°
- 2. (↑) polarizator je isto na 0°; 0°
  ↪ ako ga okrenemo na  - nema propusta svjetlosti (90°)
  ↪ na 180° ima  - nema polarizacije

## 3. Gru stroj?


& kako ga okrećemo, tako jedna točka nestaje, ne naglo ali postepeno prema okretanju

# 4. Youngov pokus:

## Tanki listići




$$x_1 - x_2 = \Delta x + \cancel{x} - \cancel{x} - 2ns = m\lambda$$

$$x_1 - x_2 = \Delta x - 2ns = m\lambda$$

$$\downarrow$$

$$\Delta x - 2ns = m\lambda = f(\alpha, n, d)$$

$$s = \frac{d}{\cos\beta} \qquad s = \frac{d}{\sqrt{1 - \frac{\sin^2\alpha}{n^2}}}$$

$$1 \sin\alpha = n \sin\beta \qquad \cos\beta = \frac{d}{s}$$

$$\sin\beta = \frac{\sin\alpha}{n}$$

$$\sin\alpha = \frac{\Delta x}{\ell} \qquad \Delta x = \ell \sin\alpha$$

$$\sin\alpha = \frac{\ell}{2s} \qquad \ell = 2s \cdot \sin\beta$$

$$\frac{2d}{\sqrt{1 - \frac{\sin^2\alpha}{n^2}}} \frac{\sin\alpha}{n} - \frac{2nd}{\sqrt{1 - \frac{\sin^2\alpha}{n^2}}} = m\lambda$$

$$\frac{2d\cancel{n}}{\sqrt{n^2 - \sin^2\alpha}} \frac{\sin\alpha}{\cancel{n}} - \frac{2n^2 d}{\sqrt{n^2 - \sin\alpha}} = -2d \frac{n^2 \sin\alpha}{\sqrt{n^2 - \sin^2\alpha}}$$

$$2d\sqrt{n^2 - \sin^2\alpha} = m\lambda \; ?$$

vrijedi za $n_{sloj} < n$

ALI Ako $n_{sloj} > n$

$$\cos\left(\frac{kx_1 - kx_2}{2} - \frac{\pi}{2}\right)$$

$$2d\sqrt{n^2 - \sin^2\alpha} = \frac{2m+1}{2}\lambda$$

$$0, \pi, 2\pi \ldots$$

$$\frac{kx_1 - kx_2}{2} = m\pi - \frac{\pi}{2}$$