

LANNACHER

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Blatt Nr.: TOL - AUG - M14

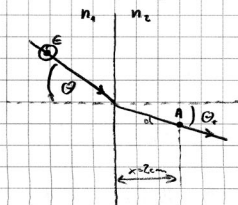
- Optički chromitor (C) polarizirani val $\lambda = 650 \text{ nm}$ i amplitude 3 V/m upadne iz zraka na granicu zrak-dielektrik pod kutem 30° . Indeks loma $n = 3.6$. Odradiš proučavanje kretanja vala naštavba propagacije, odradiš leučupost prijenosa, odradiš amplitude E i H u u tvari lepa ne nalazi 2 cm u dielektriku.
- Odradiš interval vrijednosti indeksa loma plavine dielektrične ploče debljine d , taku da za upadni kut $0 \leq \theta_i \leq 90^\circ$ energija vala zadržana anutor ploče.
- Odradiš kut za koji plavinski TM polarizirani val neće doživjeti refleksija na granici s dielektričnim poluprostorom indeksa loma 1.5. Koliki je taj kut za TE polarizirani val.
- Kolika je snaga na prijenos jednostavnog optičkog sustava koji se sastoji od optičkog predajnika snage 2 mW i svjetlovoda debljine 152 km s gubećenjem 0.25 dB/km .
- Michelsonov interferometar obazna je monokromatskom svjetlošću. Pri pomaku jednog zrcala za $2.53 \cdot 10^{-5} \text{ m}$ re primjetiti limpana 92 pruga tamnita i svijetlih pruga. Kupa je valna dužina izvora?

- $E_0 = 3 \text{ V/m}$
 $\lambda = 650 \text{ nm}$
 $\theta = 30^\circ$
 $n_2 = 3.6$
 $x = 2 \text{ cm}$

$$\sin \theta_t = \frac{\sin \theta_i}{n} \Rightarrow \theta_t = 7.98^\circ$$

$$\Gamma_r = -0.61 \quad T_r = 1 + \Gamma_r = 0.39$$

$$|E(x)| = |T_r \cdot E_0 \cdot e^{i k x}| = T_r \cdot E_0 = 1.172 \text{ V/m}$$



2) $\theta = \theta_c \Rightarrow$

$$\sin \theta_c = \frac{1}{n}$$

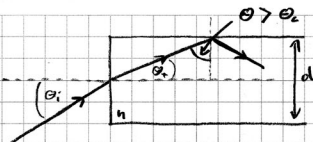
$$\theta_r = 90 - \theta_c$$

$$\theta_c = 90 - \theta_r \Rightarrow \cos \theta_c = \frac{1}{n}$$

$$\sin \theta_i = n \sin \theta_r = n \cdot \sqrt{1 - \cos^2 \theta_r} = n \cdot \sqrt{1 - \frac{1}{n^2}} = n \cdot \sqrt{\frac{n^2 - 1}{n^2}} = \sqrt{n^2 - 1}$$

$$\sin \theta_i = \sqrt{n^2 - 1}$$

grainici slabijev $\sin \theta_i = 0 \Rightarrow \sqrt{n^2 - 1} = 0$ --- okomit upad svetla endogeno
 $\sin \theta_i = 1 \Rightarrow \sqrt{n^2 - 1} = 1 \Rightarrow n \geq 2$



3)

$$n_2 = 1.5$$

TM

$$\theta_i = \theta_o = ?$$

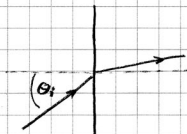
$$(\theta_o)^{\text{cr}} = \arcsin\left(\frac{n_2}{n_1}\right) = 56.31^\circ$$

TM

$$\Gamma_{\perp} = 0 \Rightarrow -\cos \theta_i + \frac{n_2}{n_1} \sqrt{1 - \frac{n_1^2}{n_2^2} \sin^2 \theta_i} = 0$$

$$\left(\frac{n_2}{n_1}\right) \left(1 - \frac{n_1^2}{n_2^2} \sin^2 \theta_i\right) = \cos^2 \theta_i = 1 - \sin^2 \theta_i$$

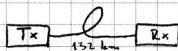
$$\sin^2 \theta_i = \frac{n_2^2}{n_1^2 + n_2^2} \Rightarrow \theta_i = 56.31^\circ$$



Za TE nema talenja kuta!!!

4)

$$\alpha \cdot L = 132 \cdot 0.25 = 33 \text{ dB}$$



$$P_{\text{av}} = P_{\text{r}} \cdot \frac{1}{\alpha \cdot L} = 1 \text{ mW}$$

$$P_{\text{av}} = P_{\text{r}} - \alpha \cdot L = 3 \text{ dBm} - 33 \text{ dB} = -30 \text{ dBm} = 10^{-3} \text{ mW}$$

5)

$$\lambda = 2.53 \cdot 10^{-6} \text{ m}$$

perioda talenja \rightarrow suprotno pravcu $\rightarrow \lambda/2$

$$32 \cdot \lambda/2 = 2.53 \cdot 10^{-6}$$

$$\lambda = 560 \text{ nm}$$