

$\lambda/2$ PLATE:

$$\psi = 2m\pi + \pi$$

$$\Delta n = n_e - n_o \quad m \sim 30-100$$

ONLY d CHANGES WITH TEMPERATURE $d(T)$

DESIGN FOR T_1 ($d_1 = d(T_1)$)

$$d_1 = \frac{\lambda}{2} \frac{1}{\Delta n} + \frac{m\lambda}{\Delta n}$$

USE AT $T_2 \Rightarrow d = d_1 + \Delta d$

$$\Delta d = \Delta T \cdot \text{CTE} \cdot d_1 \quad \text{CTE} = \text{COEFFICIENT OF THERMAL EXPANSION}$$

$$\psi = \frac{2\pi}{\lambda} (d_1 + \Delta d) \Delta n = \frac{2\pi d_1 \Delta n}{\lambda} + \frac{2\pi \Delta n \Delta d}{\lambda}$$

$$= \underbrace{2m\pi + \pi}_{\text{DESIRED PHASE}} + \underbrace{\frac{2\pi \Delta n \Delta T \cdot \text{CTE} \cdot d_1}{\lambda}}_{\text{PHASE ERROR}}$$

$$= 2m\pi + \pi + \frac{2\pi \Delta n \Delta T \cdot \text{CTE}}{\lambda} \left(\frac{\lambda}{2} \frac{1}{\Delta n} + \frac{m\lambda}{\Delta n} \right)$$

$$= 2m\pi + \pi + 2\pi \Delta T \cdot \text{CTE} \left(\frac{1}{2} + m \right)$$

m LARGE \Rightarrow LARGE CHANGE IN ψ WITH T .

CORRECTION OF ERROR

USE TWO PLATES SO THAT

$$\psi_{\text{TOTAL}} = \psi_a + \psi_b$$

$$\psi_a = 2m\pi + \pi$$

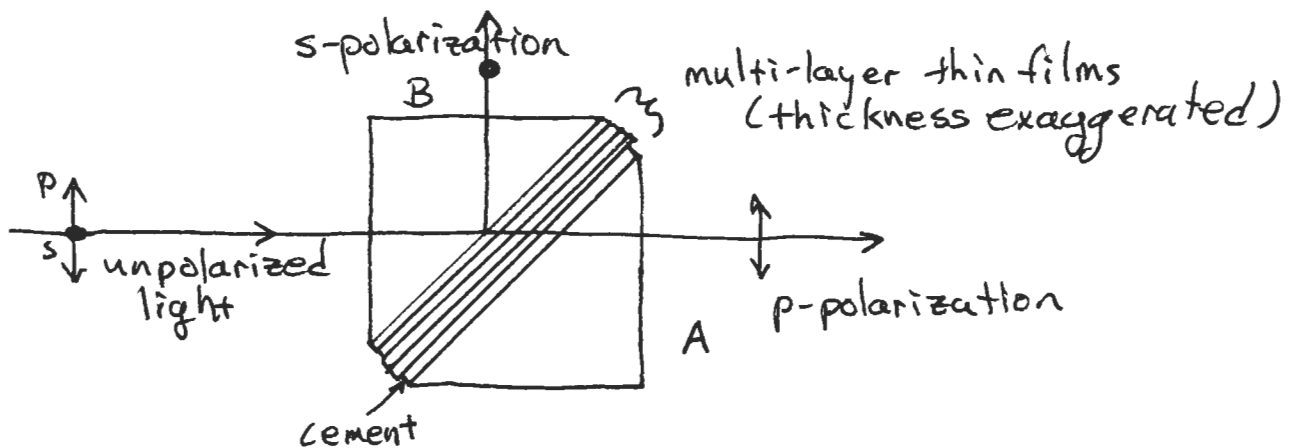
$$\psi_b = -2m\pi \quad (\text{ROTATE } 90^\circ)$$

$$\text{AT } T_1, \quad \psi_{\text{TOTAL}} = \pi$$

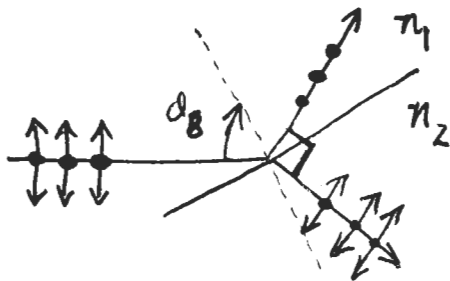
$$\text{AT } T_2, \quad \psi_{\text{TOTAL}} = \pi + 2\pi \Delta T \cdot \text{CTE} \cdot \frac{1}{2}$$

* A SIMILAR ANALYSIS CAN BE USE TO CORRECT $\Delta n(\lambda)$

Thin-film polarizing beam splitter (PBS)



The prism interface is designed to work near to Brewster's angle (no p reflection)



$$\tan \theta_B = \frac{n_2}{n_1}$$

Extinction Ratio :

At point A, measure max transmission P_{max} and min transmission P_{min} as the polarizer is rotated. The input beam is a very well polarized beam. Extinction ratio is:

$$R = P_{max}/P_{min}$$

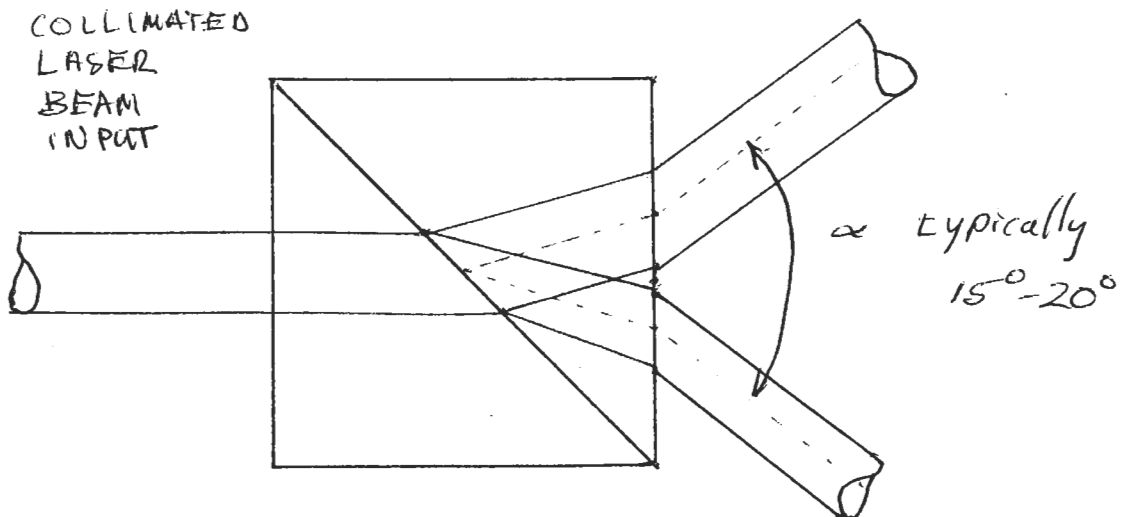
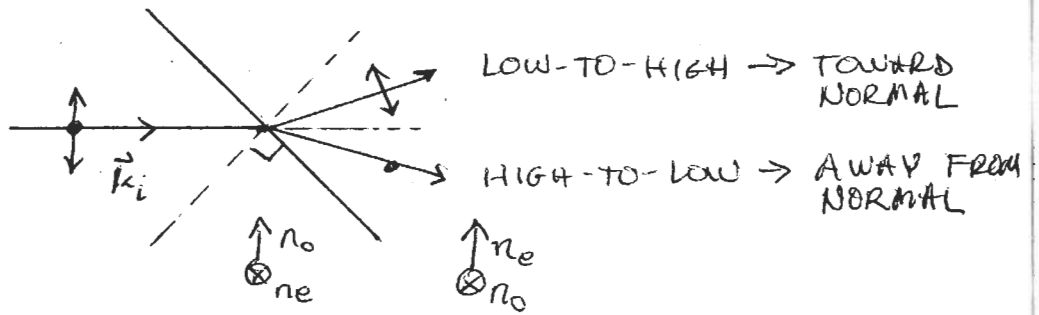
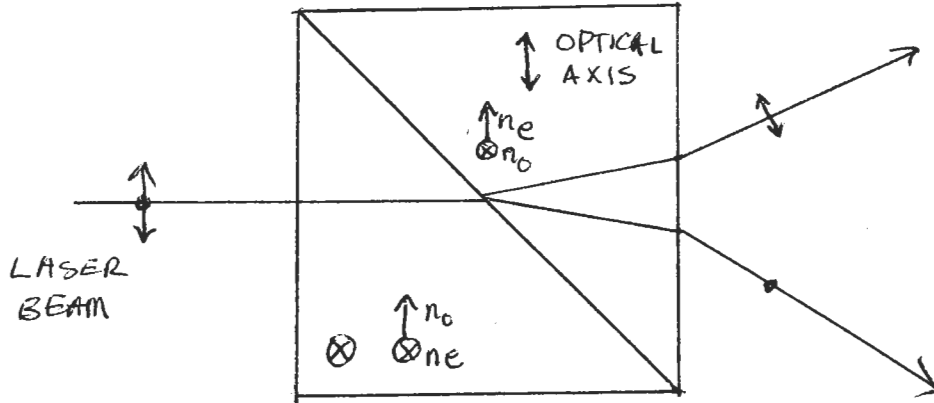
$$\text{or } R = 10 \log_2 (P_{max}/P_{min})$$

$R \sim 100$ for thin-film PBS

$\sim 10^5 - 10^6$ for Glan prisms.

QUARTZ: $n_o < n_e$
 (1.544) < (1.553)

n_e along O.A.



2-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS



