Atividade óptica

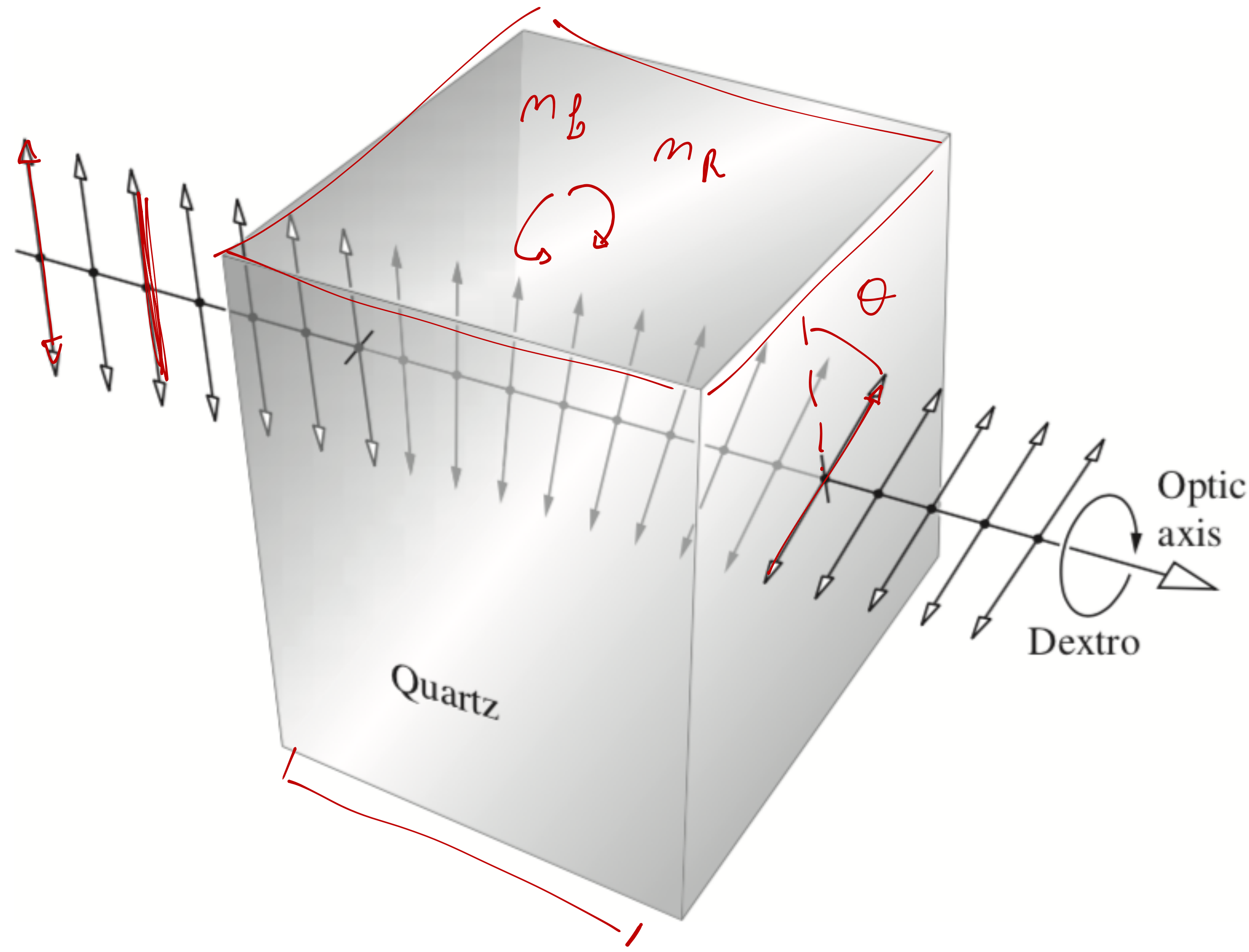


Figure 8.55 Optical activity displayed by quartz.

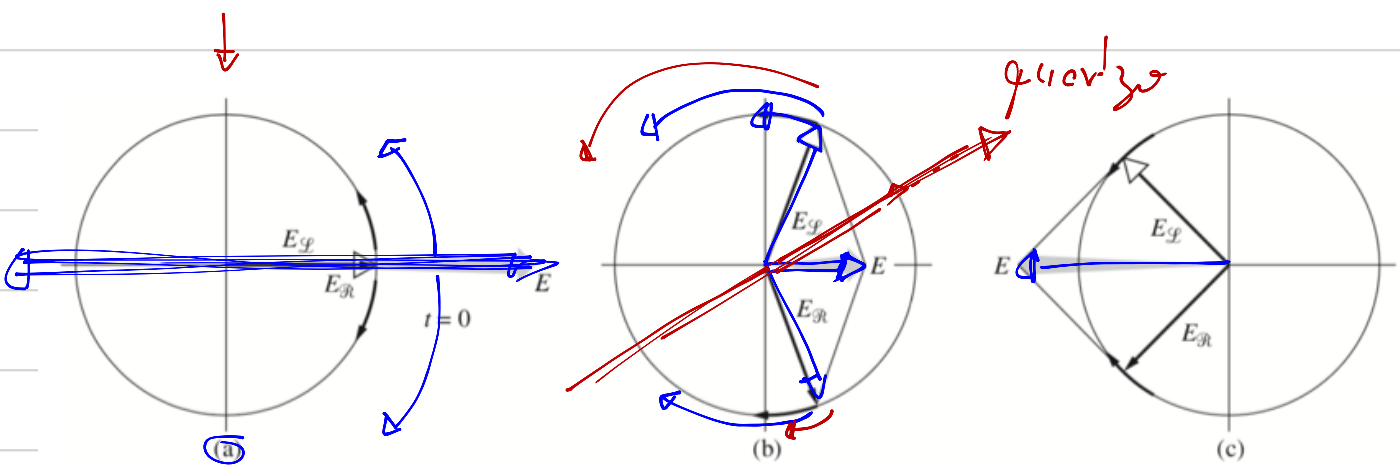


Figure 8.57 The superposition of an $\mathscr{R}$- and an $\mathscr{L}$-state at $z = 0$.

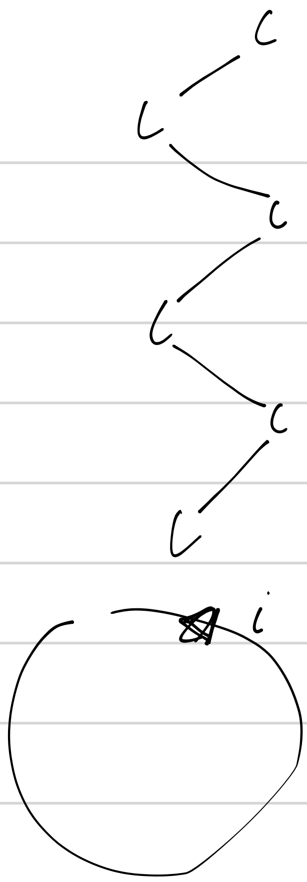
$\vec{E}_L = \vec{E}$ Levógiro$^{(n_L)}$ → circulando anti-horário

$\vec{E}_R = \vec{E}$ Dextrógiro$^{(n_R)}$ — " horário

$\vec{E} = \vec{E}_L + \vec{E}_R$ ⇒ um campo polarizado linearmente

$\boxed{n_L \neq n_R}$ → quartzo (opticamente ativo)

Origem da Atividade Óptica



(p) = momento de dipolo elétrico

m = momento de dipolo magnético

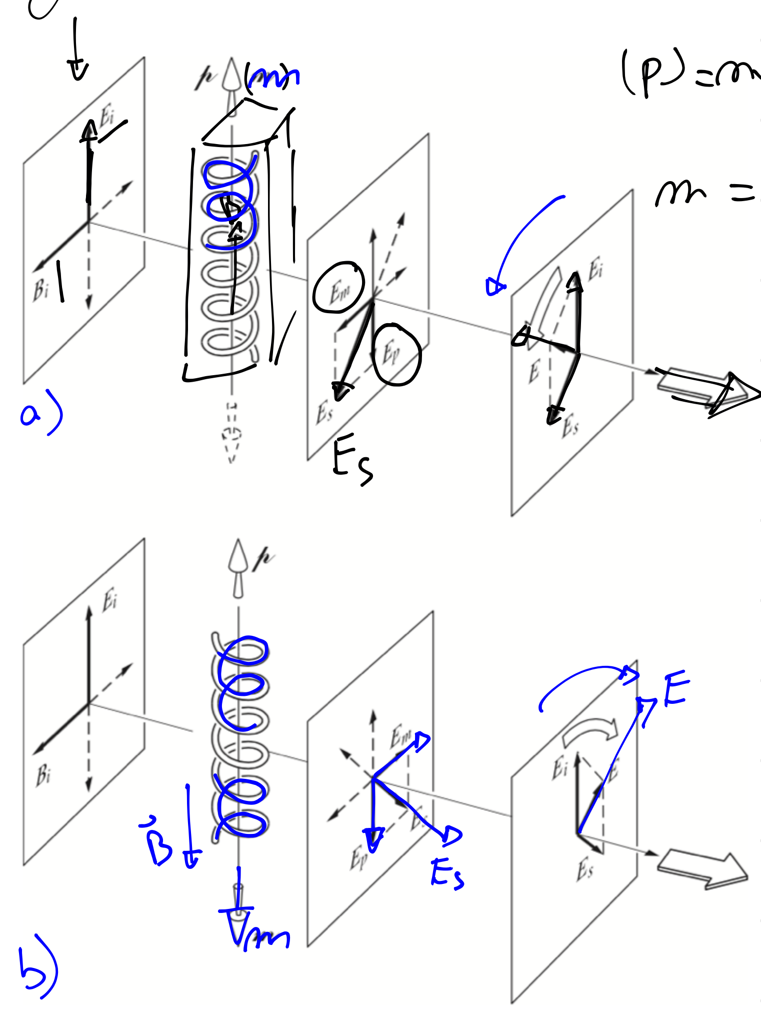
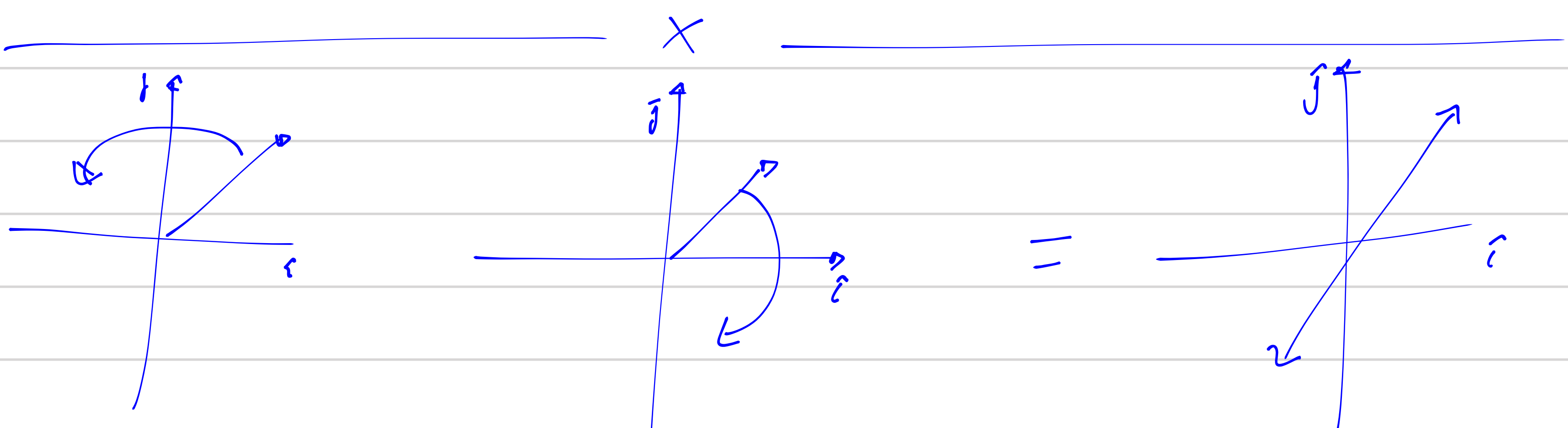


Figure 8.62 The radiation from helical molecules.



$$\vec{E}_L + \vec{E}_R = \vec{E}_T$$

$$\vec{E}_L = \frac{E_0}{2}\left[\hat{i}\cos(k_L z - \omega t) - \hat{j}\,\mathrm{sen}(k_L z - \omega t)\right] \qquad m_L$$

$$\vec{E}_R = \frac{E_0}{2}\left[\hat{i}\cos(k_R z - \omega t) + \hat{j}\,\mathrm{sen}(k_R z - \omega t)\right] \qquad m_R$$

$$\vec{E}_T = \vec{E}_L + \vec{E}_R$$

$$= E_0 \cos\left[\left(\frac{k_R + k_L}{2}\right) z - \omega t\right] \cdot \left[\hat{i}\cos\left(\frac{k_R - k_L}{2}\right) z + \hat{j}\,\mathrm{sen}\left(\left(\frac{k_R - k_L}{2}\right) z\right)\right]$$

$\rightarrow \quad \cos(a-b) = \cos a \cos b + \operatorname{sen} a \operatorname{sen} b$

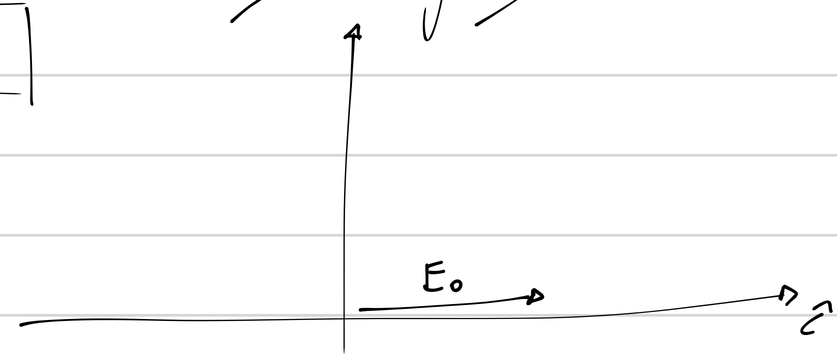
$\rightarrow \quad \operatorname{sen}(a-b) = \operatorname{sen} a \cos b - \operatorname{sen} b \cos a$

$\rightarrow \quad \cos a + \cos b = 2\cos\left(\frac{a+b}{2}\right)\cdot\cos\left(\frac{a-b}{2}\right)$

$\rightarrow \quad \operatorname{sen} a - \operatorname{sen} b = 2\operatorname{sen}\left(\frac{a-b}{2}\right)\cdot\cos\left(\frac{a+b}{2}\right)$

$z = 0 \qquad \vec{E}_T = E_0 \cos(0 - \omega t)\,(\hat{\imath}\,\cancel{\cos 0}^{\,1} + \hat{\jmath}\,\cancel{\operatorname{sen} 0})$

$$\boxed{\vec{E}_T = \hat{\imath} E_0 \cos \omega t}$$



① ②

$\rightarrow (K_R - K_L) > 0$

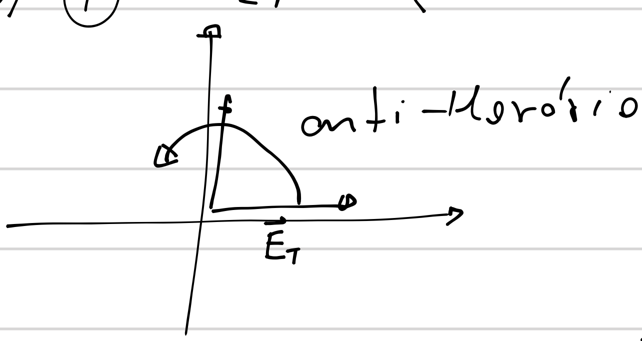
$K_R > K_L$

$\rightarrow (K_R - K_L) < 0$

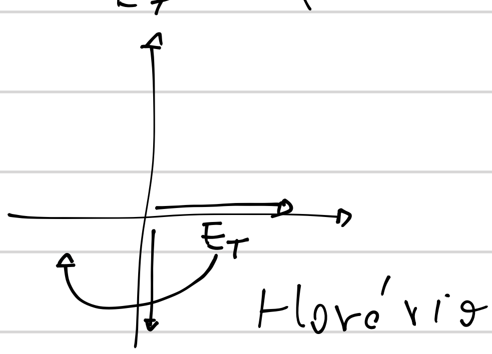
$K_R < K_L$

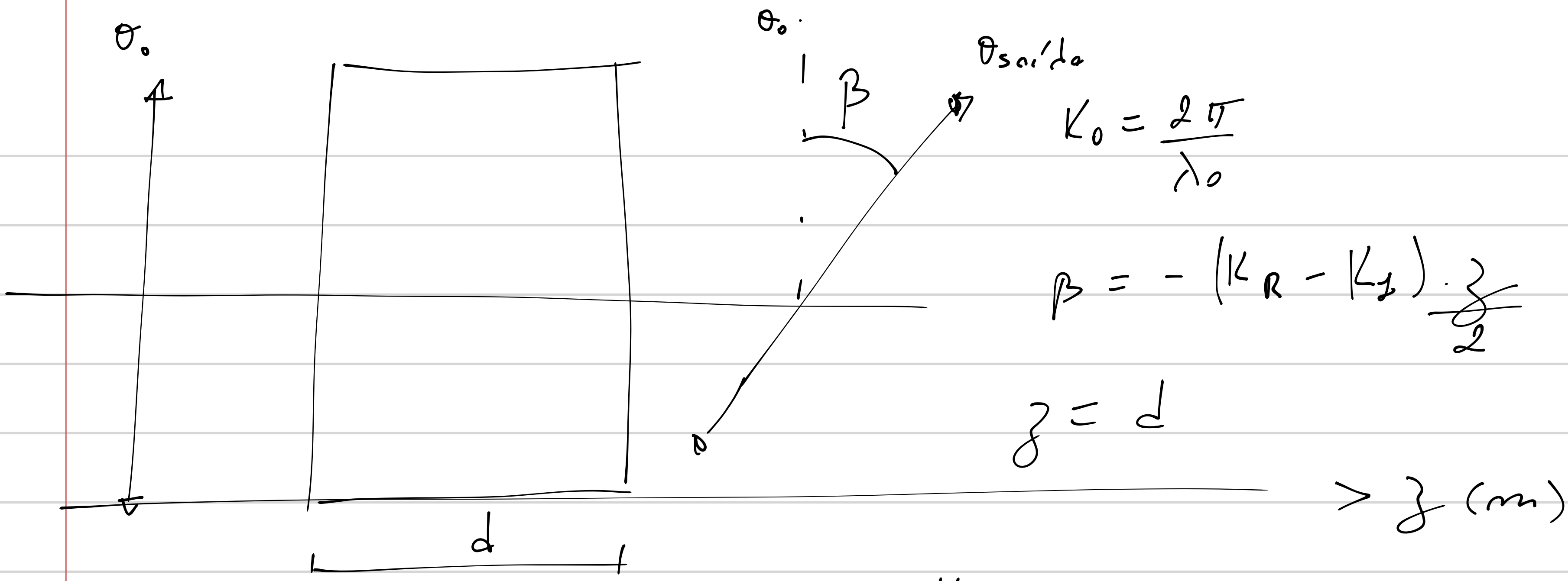
$$\vec{E}_T = E_0 \cos\left[\left(\frac{K_R + K_L}{2}\right)z - \omega t\right]\cdot\left[\hat{\imath}\cos\left(\frac{K_R - K_L}{2}\right)z + \hat{\jmath}\operatorname{sen}\left(\frac{K_R - K_L}{2}\right)z\right]$$

p/ ① $\quad \vec{E}_T = (\qquad\qquad)\cdot(\hat{\imath}\cos\underbrace{(+)} + \hat{\jmath}\operatorname{sen}\underbrace{(+)})$



p/ 2 $\quad \vec{E}_T = (\qquad\qquad)\cdot(\underbrace{\hat{\imath}\cos(-)} + \hat{\jmath}\,\underbrace{\operatorname{sen}(-)})$





$$K_0 = \frac{2\pi}{\lambda_0}$$

$$\beta = -(K_R - K_L)\cdot\frac{z}{2}$$

$$z = d$$

$$K_R = K \cdot n_R$$

$$K_L = K \cdot n_L$$

$$\beta = -\frac{2\pi}{\lambda_0}(n_R - n_L)\frac{d}{2}$$

$$\boxed{\beta = \frac{\pi d}{\lambda_0}\underbrace{(n_L - n_R)}}$$
