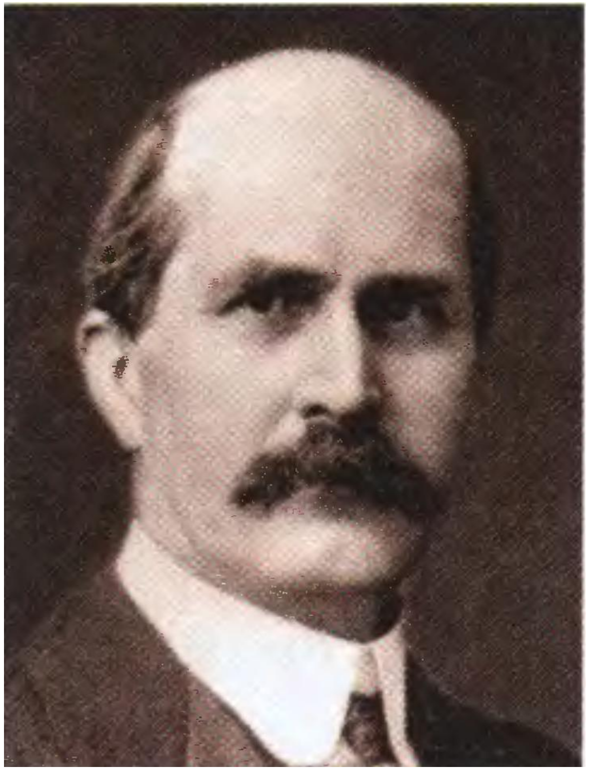
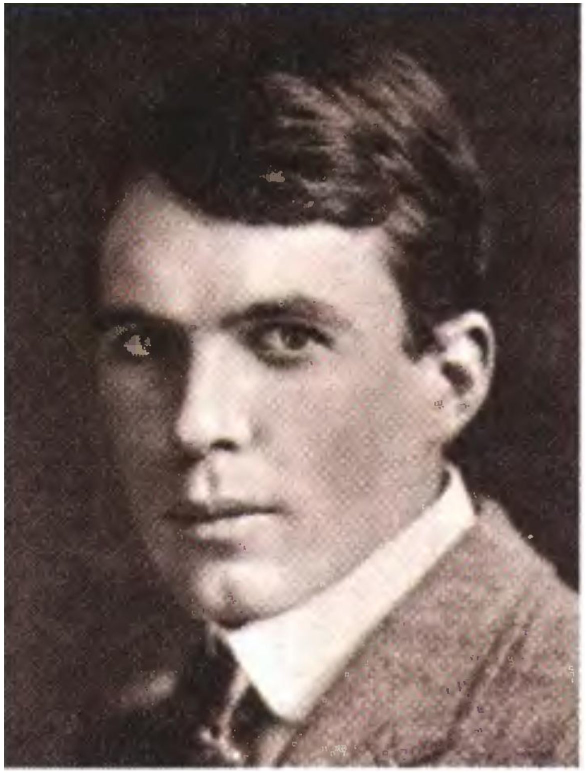
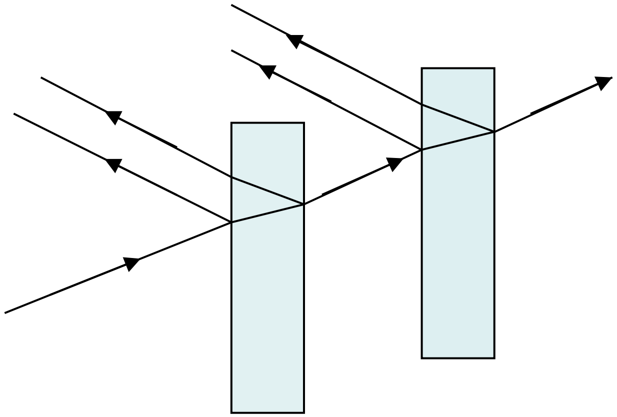
Akustooptika

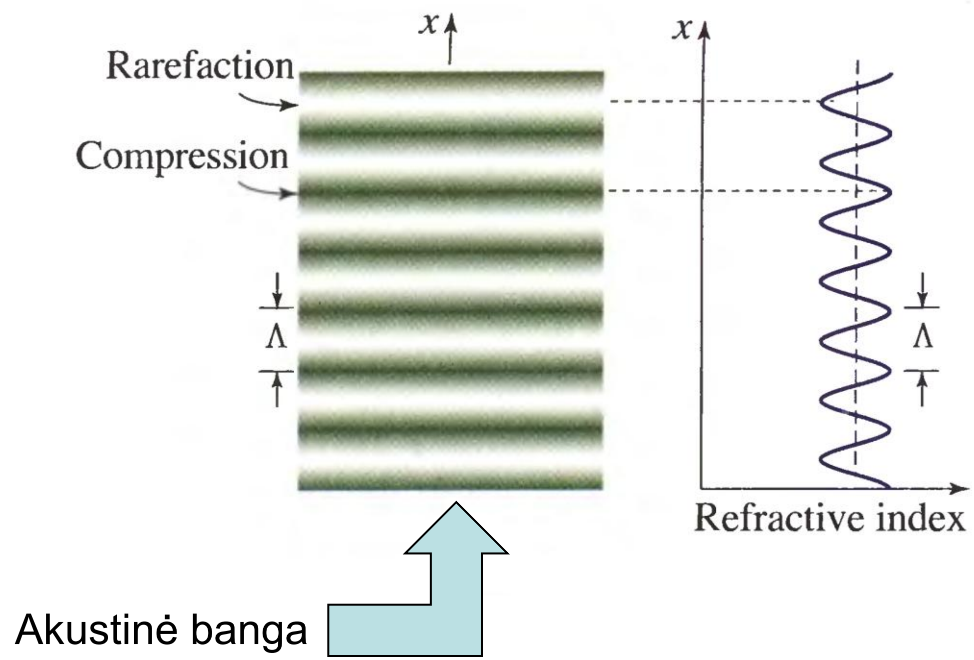


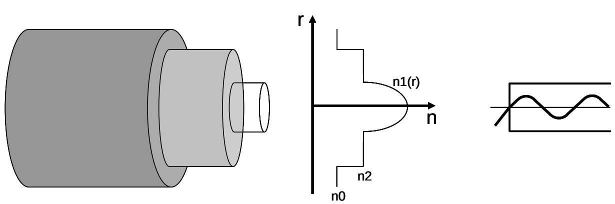


Sir William Henry Bragg (1862–1942, left) and **Sir William Lawrence Bragg (1890–1971**, right), a father-and-son team, were awarded the Nobel Prize in 1915 for their studies of the diffraction of light from periodic structures, such as those created by sound.

Akustooptika

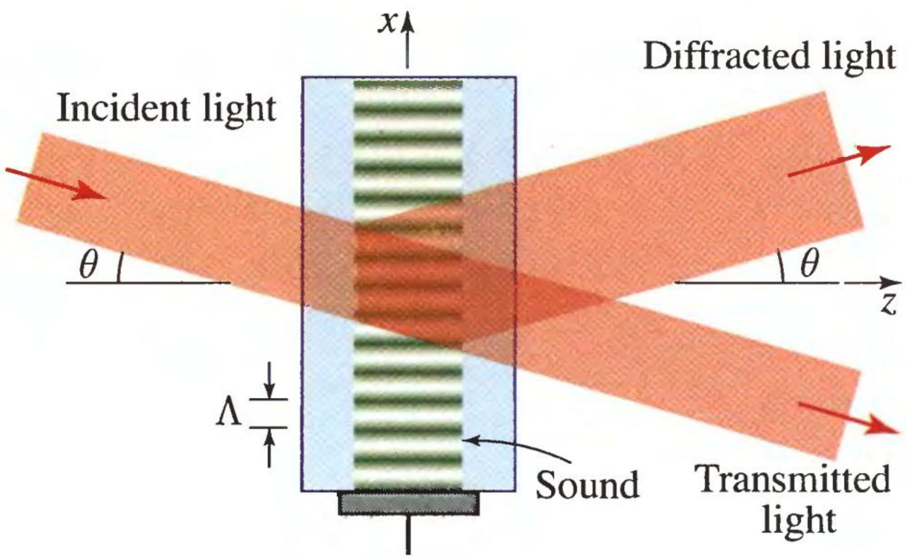






$$n(y) = n_0\sqrt{(1-\Delta y^2)} \approx n_0\left(1-\frac{1}{2}\Delta y^2\right)$$

Akustooptika



$$\sin\theta = \frac{\lambda}{2\Lambda}$$

Brego difrakcija
Brego atspindys
Brego sklaida

Šviesos greitis >> garso greitis

Akustooptika

Fototamprumo reiškinys

$$\Delta\left(\frac{1}{n^2}\right)_{i,d} = \hat{p}_{idkl}S_{kl}$$

$$S_{kl}(\;) = \frac{1}{2}\left[\frac{\partial U_k(\;)}{\partial x_l} + \frac{\partial U_l(\;)}{\partial x_k}\right]$$

$$\vec{D}_k = \varepsilon_{kl}\vec{E}_l$$ Elektrinės indukcijos vektorius

$$W = \frac{1}{2}\vec{E}\vec{D} = \frac{1}{2}\vec{E}_k\varepsilon_{kl}\vec{E}_l$$ Pernešamos energijos tankis

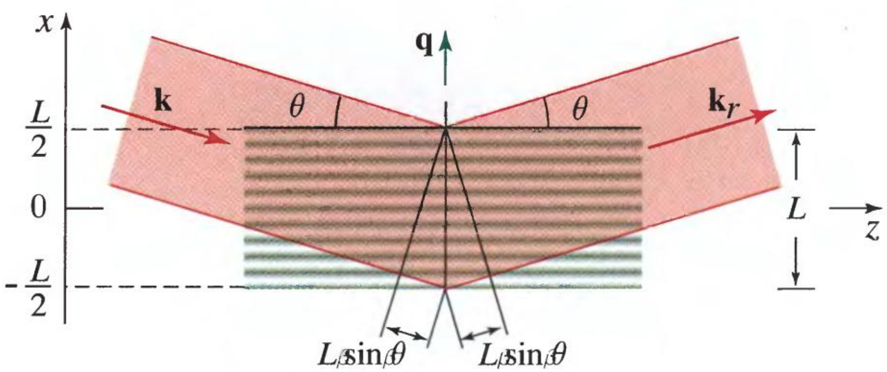
Bendru atveju:

$$2W = \varepsilon_{xx}E_x^2 + \varepsilon_{yy}E_y^2 + \varepsilon_{zz}E_z^2 + 2\varepsilon_{yz}E_yE_z + 2\varepsilon_{xz}E_xE_z + 2\varepsilon_{xy}E_xE_y$$

Akustinės bangos galia:

$$\Delta P_i = -\left(\frac{\varepsilon_i\varepsilon_d}{\varepsilon_0}\right)P_{idkl}S_{kl}E_d$$

Akustooptika



$$s(x,t) = S_0 \cos(\Omega t - kx)$$

$$I_a = \frac{1}{2}\rho v_a^3 S_0^2$$

$$\Delta n(x,t) = -\frac{1}{2}\gamma n^3 s(x,t)$$

$$n(x,t) = n - \Delta n_0 \cos(\Omega t - kx)$$

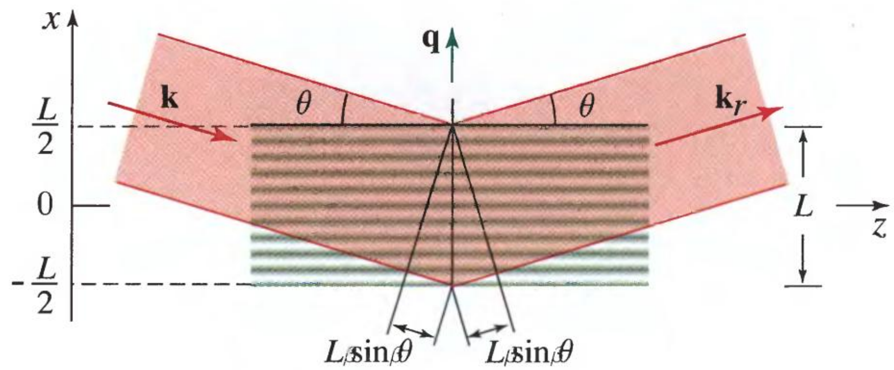
$$\Delta n_0 = \frac{1}{2}\gamma n^3 S_0$$

$$\Delta n_0 = \frac{1}{2}\sqrt{(M I_a)}$$

$$M = \frac{\gamma^2 n^6}{\rho v_a^3}$$

γ - fotoelastinė pastovioji

Akustooptika



Atspindžio koeficientas

$$\Delta r = \left(\frac{dr}{dx}\right)\Delta x$$ - elementarus atspindys nuo vieno paviršiaus

$$r = \int_{-L/2}^{L/2} \exp(jkx\sin\theta)\left(\frac{dr}{dx}\right) dx$$

$$\frac{dr}{dx} = \frac{dr}{dn}\frac{dn}{dx} = \frac{dr}{dn} k_a \Delta n_0 \sin(k_a x - \varphi) \qquad \sin(k_a x - \varphi) = \left[e^{j(k_a x - \varphi)} - e^{-j(k_a x - \varphi)}\right]/2j$$

$$r = jr_0 e^{j\varphi}\frac{1}{L}\int_{-L/2}^{L/2} e^{j(2k\sin\theta - k_a)} dx - jr_0 e^{-j\varphi}\frac{1}{L}\int_{-L/2}^{L/2} e^{j(2k\sin\theta + k_a)} dx \qquad r_0 = \frac{1}{2}\Delta n_0 k_a L \frac{dr}{dn}$$

$$\varphi = \Omega t$$

$$r = r_+ + r_-$$

$$r_\pm = \pm jr_0 \sin c\left[(2k\sin\theta \mp k_a)\frac{L}{2\pi}\right] e^{\pm j\Omega t} \qquad \sin c(x) = \frac{\sin(\pi x)}{(\pi x)}$$

Akustooptika

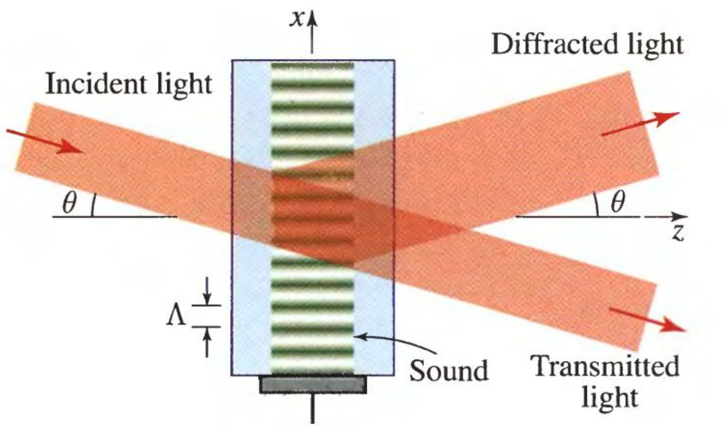
$$r_{\pm} = \pm j r_0 \operatorname{sinc}\left[\left(2k\sin\theta \mp k_a\right)\frac{L}{2\pi}\right] e^{\pm j\Omega t}$$

maksimali, kai

$$2k\sin\theta - k_a = 0$$

$$\sin\theta = \frac{\lambda}{2\Lambda}$$

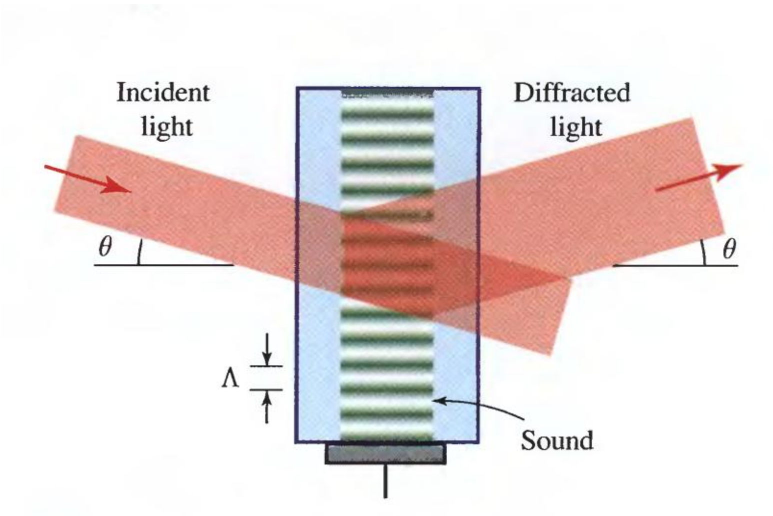
Brego difrakcijos sąlyga

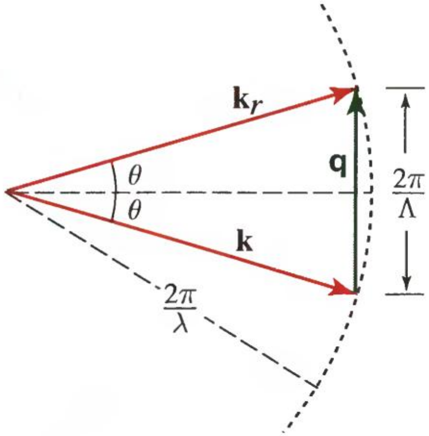


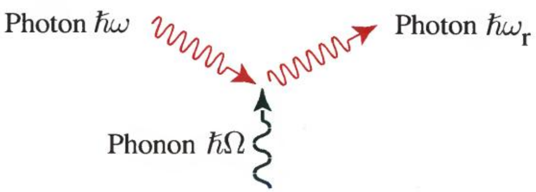
Akustooptika

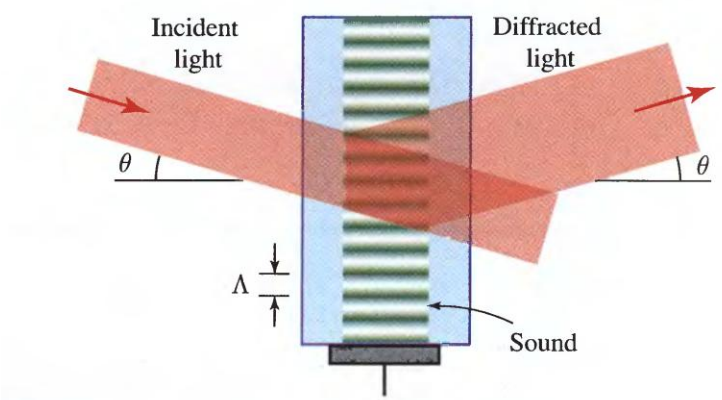
$$\vec{k}_{dif} = \vec{k} + \vec{k}_a$$

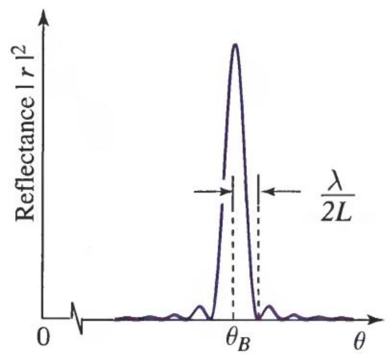
$$\omega_{dif} = \omega + \Omega_a$$











Akustooptika

$$\mathcal{R} = \tfrac{1}{4}\,\Delta n_0^2\, q^2 L^2 \left|\frac{d\mathfrak{r}}{dn}\right|^2 .$$

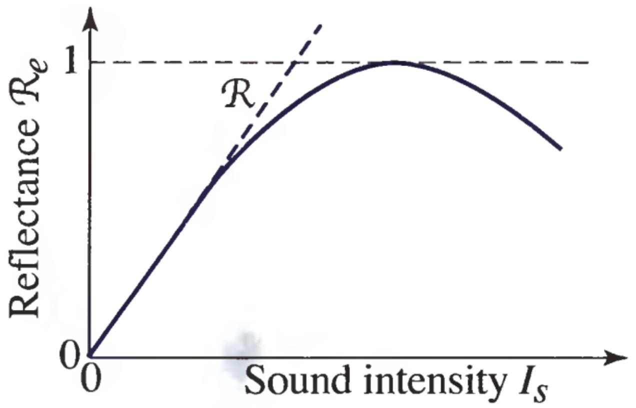
$$\frac{d\mathfrak{r}}{dn} = \frac{-1}{2n\sin^2\theta}.$$

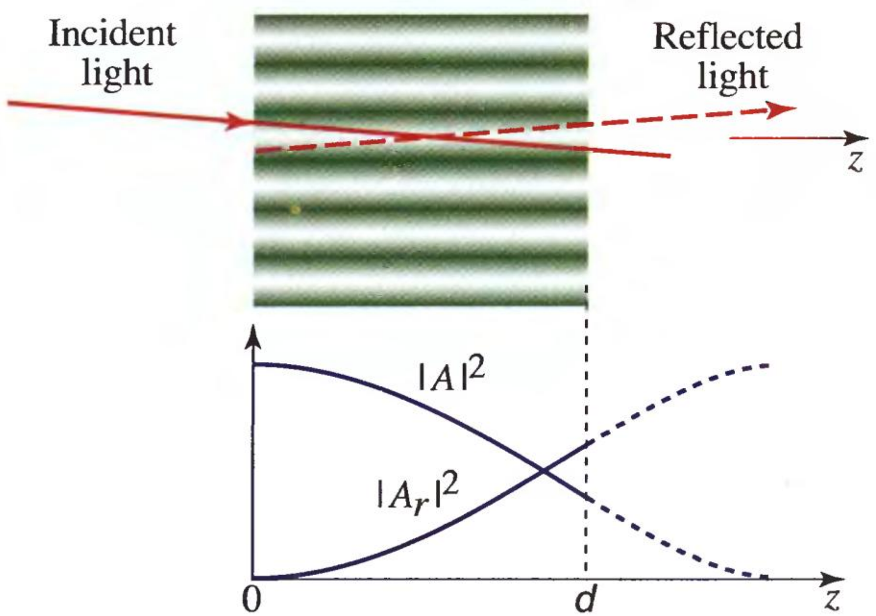
$$\frac{d\mathfrak{r}}{dn} = \frac{-\cos 2\theta}{2n\sin^2\theta}.$$

$$\mathcal{R} = \frac{\pi^2}{\lambda_o^2}\left(\frac{L}{\sin\theta}\right)^2 \Delta n_0^2.$$

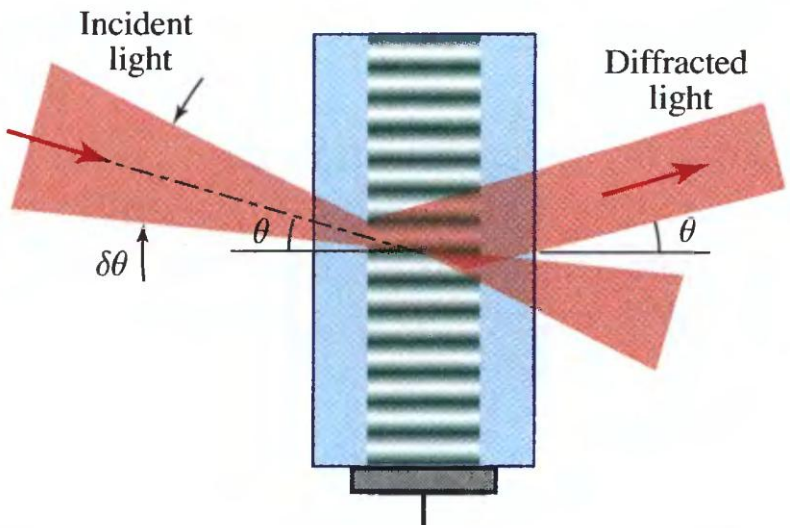
$$\mathcal{R} = 2\pi^2 n^2 \frac{L^2\Lambda^2}{\lambda_o^4}\mathcal{M} I_s.$$

$$\mathcal{R}_e = \sin^2\sqrt{\mathcal{R}},$$



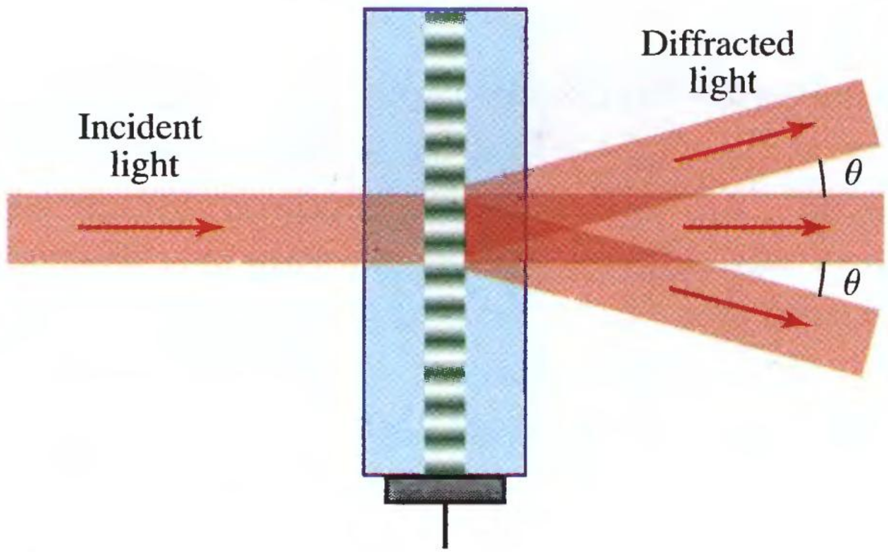


Akustooptika



$$\sin\frac{\theta}{2} = \frac{\lambda}{2\Lambda}.$$

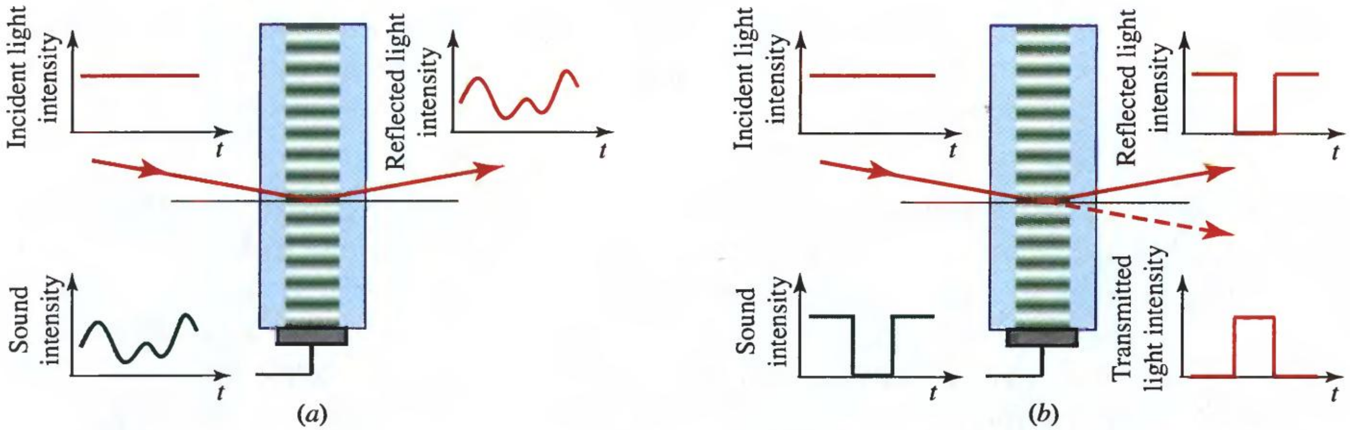
Brego difrakcija

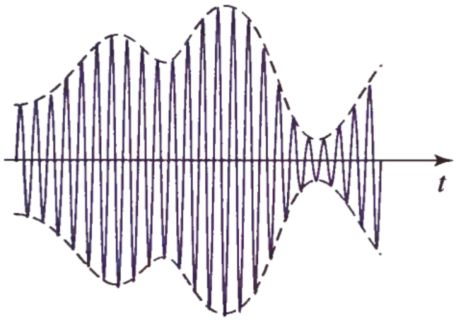


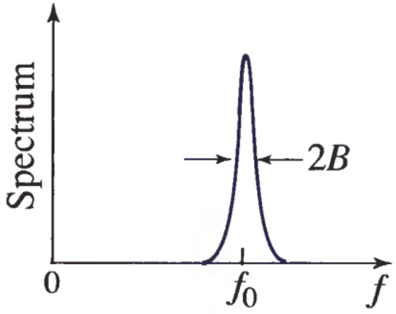
$$\theta \approx \frac{\lambda}{\Lambda}.$$

Ramano-Nato difrakcija

Akustooptika







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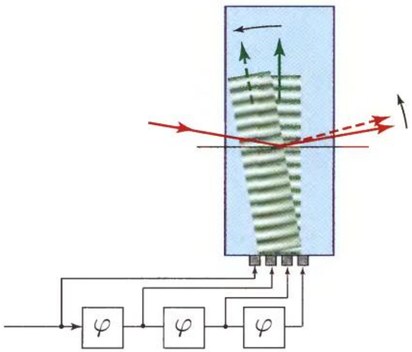
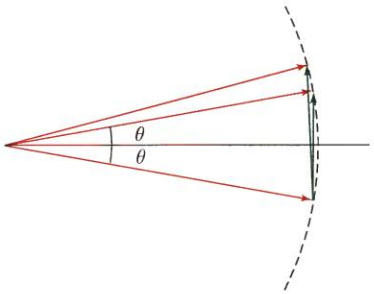


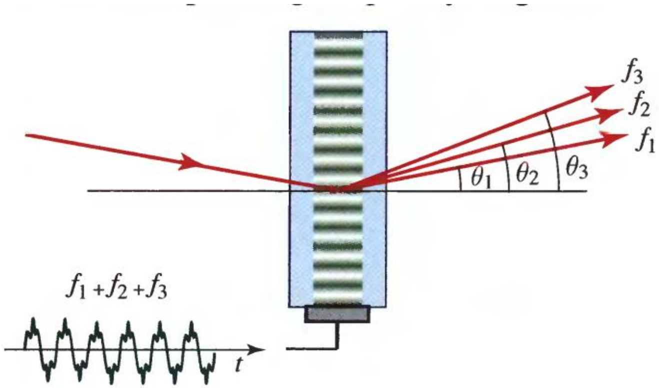


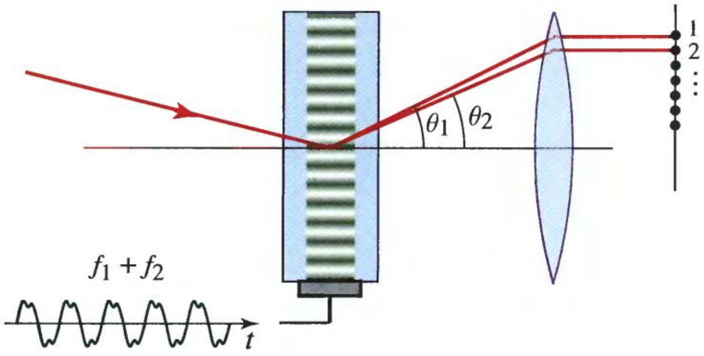
$$\Delta\theta = \frac{\lambda}{v_s} B.$$

$$B = v_s \frac{\delta\theta}{\lambda} = \frac{v_s}{D},$$

Skeneris

$$B = \frac{1}{T}, \qquad T = \frac{D}{v_s},$$





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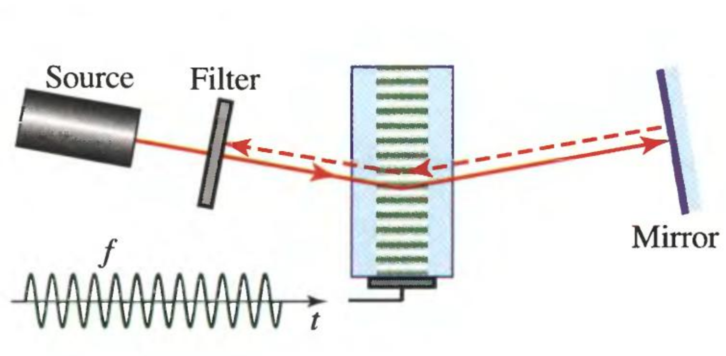

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