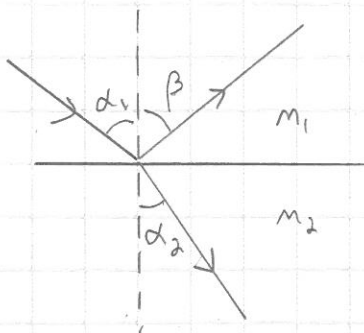


15. Valo rajepinnassa

Valon nopeus riippuu väliaineesta

$$c_1 = \frac{c}{n_1}$$

n_1 : aineen 1 taittekerroin (≥ 1)
(ilma: $n_1 \approx 1,0003 \approx 1,000$)



$\alpha_1 = \beta$ heijestulaki

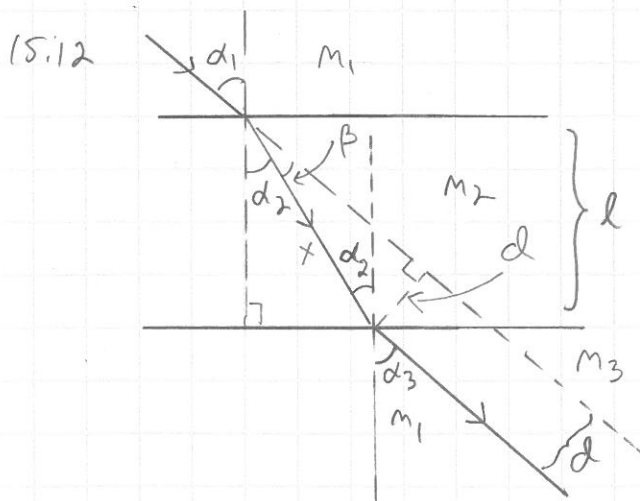
$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{c_1}{c_2} = \frac{\frac{c}{n_1}}{\frac{c}{n_2}} = \frac{c}{n_1} \cdot \frac{n_2}{c} = \frac{n_2}{n_1} \quad | \times$$

$$\Rightarrow \boxed{n_1 \sin \alpha_1 = n_2 \sin \alpha_2} \quad \text{TAITTUMISLAKI VALOLLE}$$

Rajepinnassa taajuus ei muutu:

$$\frac{c_1}{c_2} = \frac{\lambda_1 f}{\lambda_2 f} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

Sääntö: "lähempi aalto kulkee lähempänä normaalia"
Kun $c_2 < c_1$, joten aine 2 on optisesti (aalto-optisesti) tiheämpi kuin aine 1.



$$l = 2,5 \text{ mm}, \quad \alpha_1 = 55^\circ, \quad n_1 = 1,00 \\ n_2 = 1,51, \quad n_3 = 1,00$$

Taittumislaki valolle:

$$\begin{cases} n_1 \sin \alpha_1 = n_2 \sin \alpha_2 \\ n_2 \sin \alpha_2 = n_3 \sin \alpha_3 \end{cases}$$

$$\Rightarrow n_1 \sin \alpha_1 = n_3 \sin \alpha_3 \quad | : n_1$$

$$\Rightarrow \sin \alpha_1 = \sin \alpha_3$$

$$\Rightarrow \alpha_1 = \alpha_3 \quad (\text{tai } \alpha_1 = 180^\circ - \alpha_3 \text{ } \downarrow)$$

$\Rightarrow$ kohteiden yhdensuurtaisuksi

$$n_1 \sin \alpha_1 = n_2 \sin \alpha_2 \quad \Rightarrow \sin \alpha_2 = \frac{n_1 \sin \alpha_1}{n_2} = \frac{1,00 \cdot \sin 55^\circ}{1,51} \Rightarrow \alpha_2 \approx 32,85^\circ$$

$$\beta = \alpha_1 - \alpha_2 \approx 22,15^\circ$$

$$\cos \alpha_2 = \frac{l}{x} \quad \Rightarrow \quad x = \frac{l}{\cos \alpha_2} = \frac{2,5 \text{ mm}}{\cos 32,85^\circ} \approx 2,976 \text{ mm}$$