

10-10) a) $v_1 = 14100 \text{ m/s}$ $v_2 = 7100 \text{ m/s}$ $\alpha_1 = 58^\circ$

Tahtumislaki $\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2}$ ~~|| sin~~

$$\sin \alpha_2 \cdot v_1 = \sin \alpha_1 \cdot v_2 \quad || : v_1$$

$$\sin \alpha_2 = \frac{\sin \alpha_1 \cdot v_2}{v_1}$$

$$\sin \alpha_2 = \frac{\sin 58^\circ \cdot 7100 \text{ m/s}}{14100 \text{ m/s}} = 0,427 \dots \quad || \sin^{-1}$$

$$\alpha_2 = 25,27 \dots^\circ \approx \underline{\underline{25^\circ}}$$

b) $v_1 = 10100 \text{ m/s}$ $v_2 = 11200 \text{ m/s}$

Kokonaiheijastuksen rajakulma saadaan, kun tahtumislakiin sijoitetaan taittekulmaksi $\alpha_2 = 90^\circ$

Tahtumislaki $\frac{\sin \alpha_1}{\sin 90^\circ} = \frac{v_1}{v_2}$ ($\sin 90^\circ = 1$)

$$\sin \alpha_1 = \frac{v_1}{v_2} = \frac{10100 \text{ m/s}}{11200 \text{ m/s}} = 0,901 \dots \quad || \sin^{-1}$$

$$\alpha_1 = 64,39 \dots^\circ \approx \underline{\underline{64^\circ}}$$

10-15

$$n_{12} = 0,70$$

$$\alpha = 35^\circ$$

$$\alpha_1 = 35^\circ$$

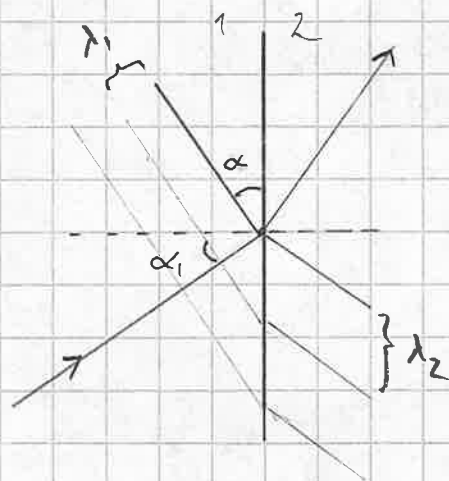
Tahtumislaki

$$\frac{\sin \alpha_1}{\sin \alpha_2} = n_{12}$$

$$\sin \alpha_2 = \frac{\sin \alpha_1}{n_{12}}$$

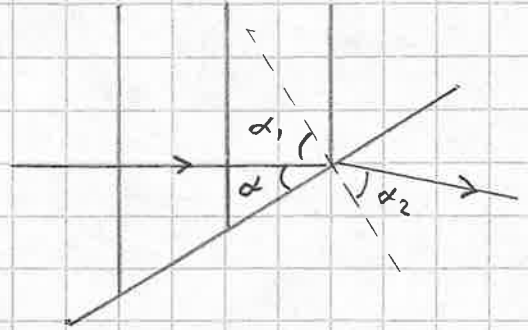
$$\sin \alpha_2 = \frac{\sin 35^\circ}{0,70} = 0,819 \dots \quad || \sin^{-1}$$

$$\alpha_2 = 55,02 \dots^\circ \approx 55^\circ$$



Aallonpituus on suurempi aineessa 2

10-16) $\alpha = 30^\circ$ $f_1 = 7,1 \text{ Hz}$
 $\lambda_1 = 3,2 \text{ cm}$ $\lambda_2 = 2,6 \text{ cm}$



a) AALTOLIIKKEEN PERUSYHTÄLÖ

$$v_1 = f_1 \lambda_1$$

$$v_1 = 7,1 \text{ Hz} \cdot 3,2 \text{ cm}$$

$$= 22,72 \text{ cm/s} \approx 23 \text{ cm/s}$$

$$= \underline{\underline{0,23 \text{ m/s}}}$$

b) Taajuus ei muutu, eli $f_2 = 7,1 \text{ Hz}$

$$\text{Aallon nopeus } v_2 = f_2 \lambda_2 = 7,1 \text{ Hz} \cdot 2,6 \text{ cm} = 18,46 \text{ cm/s}$$

$$\approx \underline{\underline{0,18 \text{ m/s}}}$$

c) Taittumislain mukaan $\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{\lambda_1}{\lambda_2}$

$$\text{Tulokulma } \alpha_1 = 90^\circ - \alpha$$

$$= 90^\circ - 30^\circ = 60^\circ$$

$$\sin \alpha_2 = \frac{\sin \alpha_1 \cdot \lambda_2}{\lambda_1}$$

$$\sin \alpha_2 = \frac{\sin 60^\circ \cdot 2,6 \text{ cm}}{3,2 \text{ cm}} = 0,703... \quad \parallel \sin^{-1}$$

$$\alpha_2 = 44,72...^\circ \approx \underline{\underline{45^\circ}}$$