

Rajajännitteen taajuuksien ja siirtymien:

$$f = \frac{v_1}{\lambda_1} = \frac{v_2}{\lambda_2} \quad (\Rightarrow) \quad \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = n_{12} \text{ taitekerroin}$$

$$\alpha_1 = \beta$$

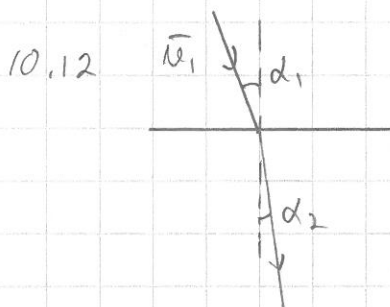
$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = n_{12}$$

HEIJASTUSLAKI

TAITUMISLAKI

"Tihempi aalto kulkee lähempänä normaalia"

Huom. Koska $v_1 > v_2 \Rightarrow$ aine 1 on aalto-opeasti harveampi ja aine 2 aalto-opeasti tihempi aine



$$\alpha_1 = 15^\circ, \quad v_1 = 25 \frac{\text{m}}{\text{s}}, \quad n_{12} = 1,9$$

a) Taittumislaki $\frac{\sin \alpha_1}{\sin \alpha_2} = n_{12} \quad | \cdot \frac{\sin \alpha_2}{n_{12}}$

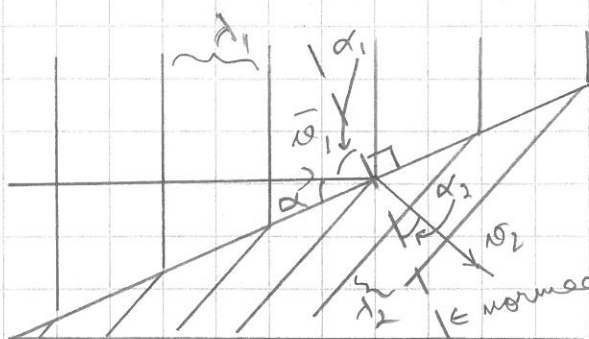
$$\Rightarrow \sin \alpha_2 = \frac{\sin \alpha_1}{n_{12}} = \frac{\sin 15^\circ}{1,9} \approx 0,136221$$

$$\Rightarrow \alpha_2 = 7,8232^\circ \approx \underline{7,8^\circ}$$

b) $\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2} = n_{12} \quad | \cdot \frac{v_2}{n_{12}}$

$$\Rightarrow v_2 = \frac{v_1}{n_{12}} = \frac{25 \frac{\text{m}}{\text{s}}}{1,9} \approx 13,1579 \frac{\text{m}}{\text{s}} \approx \underline{13 \frac{\text{m}}{\text{s}}}$$

10.16



$$f = 7,1 \text{ Hz}, \quad \lambda_1 = 3,2 \text{ cm}$$

$$\lambda_2 = 2,6 \text{ cm}, \quad \alpha = 30^\circ$$

a) aaltoliikkeen perusfritelo:

$$v_1 = \lambda_1 f = 0,032 \text{ m} \cdot 7,1 \frac{1}{\text{s}}$$

$$= 0,2272 \frac{\text{m}}{\text{s}} \approx \underline{0,23 \frac{\text{m}}{\text{s}}}$$

b) Rajajännitteen taajuuksien ja siirtymien $\Rightarrow f = 7,1 \text{ Hz}$

$$v_2 = \lambda_2 f = 0,026 \text{ m} \cdot 7,1 \frac{1}{\text{s}} = 0,1846 \frac{\text{m}}{\text{s}} \approx \underline{0,18 \frac{\text{m}}{\text{s}}}$$

c) tulokulma: $\alpha_1 = 90^\circ - \alpha = 60^\circ$

Taittumislaki: $\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$

$$\Rightarrow \sin \alpha_2 = \frac{\lambda_2 \sin \alpha_1}{\lambda_1} = \frac{2,6 \text{ cm} \cdot \sin 60^\circ}{3,2 \text{ cm}} \approx 0,703646$$

$$\Rightarrow \alpha_2 = 44,7202^\circ \approx \underline{45^\circ}$$