Fizika 2

Lekcija

$f \cdot \lambda = v$

Vides laušanās koeficients: $n = \dfrac{C}{v}$

$$\boxed{v_2 = \frac{v_1}{n_2};\ \lambda_2 = \frac{\lambda_1}{n_2}}$$

EM. viļņi

$\dfrac{\partial^2 y}{\partial x^2} = \dfrac{1}{v^2}\dfrac{\partial^2 y}{\partial t^2}$ (mehāniskā viļņa diferenciālvienādojums)

$\dfrac{\partial^2 \vec{E}}{\partial x^2} + \dfrac{\partial^2 \vec{E}}{\partial y^2} + \dfrac{\partial^2 \vec{E}}{\partial z^2} = \varepsilon_0\mu_0\varepsilon\mu\dfrac{\partial^2 \vec{E}}{\partial t^2}$ (viļņa dif. vien. el. lauka intens. E)

$\dfrac{\partial^2 \vec{H}}{\partial x^2} + \dfrac{\partial^2 \vec{H}}{\partial y^2} + \dfrac{\partial^2 \vec{H}}{\partial z^2} = \varepsilon_0\mu_0\varepsilon\mu\dfrac{\partial^2 \vec{H}}{\partial t^2}$ (viļņa dif. vien. magn. lauka intens. H)

$$\boxed{v = \frac{1}{\sqrt{\varepsilon_0\mu_0\varepsilon\mu}}}$$

$v_{\text{vakuumā}} = 3 \cdot 10^8\ \dfrac{\text{m}}{\text{s}}$

Plakans monohromatiskais EMV.

$\vec{E}$ un $\vec{H}$ mainās ar vienādām frekvencēm: $\omega_1 = \omega_2 = \omega$

$k_1 = k_2 = k,\ k = \dfrac{\omega}{v}$ (k ir viļņu skaits, $k = \dfrac{2\pi}{\lambda}$)

$\varphi_{01} = \varphi_{02} = \varphi_0$

$$\boxed{\sqrt{\varepsilon_0\varepsilon}E_m = \sqrt{\mu_0\mu}H_m}$$

Monohromatiskā plakana viļņa vienādojumi:

$\vec{E} = \vec{E}_m\cos(\omega t - kx + \varphi_0)$

$\vec{H} = \vec{H}_m\cos(\omega t - kx + \varphi_0)$

EMV svarīgākās īpašības.

1. Atstarošana un laušana

2. Viļņu enerģija un tās blīvums.

$w = \dfrac{dW}{dV}$ - enerģijas blīvums

$w = w_E + w_H = \dfrac{\varepsilon_0\varepsilon E^2}{2}\dfrac{\mu_0\mu H^2}{2}$

$\sqrt{\varepsilon_0\varepsilon}E = \sqrt{\mu_0\mu}H$

$w = \sqrt{\varepsilon_0 \mu_0 \varepsilon \mu} EH \Rightarrow w = \frac{1}{v} EH$

3. Energijas plūsma un tās blīvums.
$\vec{S} = \vec{E} \times \vec{H}$ (jaudas plūsma)

4. EMV impulss un spiediens
$\varepsilon = \text{const}$, $\mu = \text{const}$
$dF = dIlB = jdLlB = jsV\mu_0\mu H$

$$\boxed{p = \frac{(1+r)dW}{vLdt} = (1+r)\frac{S}{v} = (1+r)w}$$

Saule: $p \approx 20\ \mu\text{Pa}$

Modernie lāzeri: $E_s = 10^{25} \frac{\text{W}}{\text{m}^2}$;
$p = 3 \cdot 10^{16}\ \text{Pa} \approx 3 \cdot 10^{11}\ \text{atm}.$