Równania Maxwella dla dielektryka $rot\vec{\mathcal{H}} - \dot{\vec{\mathcal{D}}} = 0 \quad rot\vec{\mathcal{E}} + \dot{\vec{\mathcal{B}}} = 0 \quad div\vec{\mathcal{D}} = 0 \quad div\vec{\mathcal{B}} = 0$ (1)

Równania materiałowe $\vec{\mathcal{D}} = \bar{\varepsilon}\vec{\mathcal{E}} \quad \bar{\varepsilon} = \varepsilon_0 \begin{pmatrix} n_x^2 & 0 & 0 \\ 0 & n_y^2 & 0 \\ 0 & 0 & n_z^2 \end{pmatrix} = \begin{pmatrix} \varepsilon_x & 0 & 0 \\ 0 & \varepsilon_y & 0 \\ 0 & 0 & \varepsilon_z \end{pmatrix} \qquad \vec{\mathcal{B}} = \mu\vec{\mathcal{H}}$ (2)

Równanie fali płaskiej $\vec{\mathcal{E}}(\vec{r},t) = \vec{E}\exp[i(\omega t - \vec{k}\cdot\vec{r})],\ \vec{\mathcal{H}}(r,t) = \vec{H}\exp[i(\omega t - \vec{k}\cdot\vec{r})]$ (3)

(1)+(2)+(3) $\begin{cases} n\hat{s}\times\vec{E} = \mu c\vec{H} \\ n\hat{s}\times\vec{H} = -c\bar{\varepsilon}\vec{E} \end{cases}$ (4)

(4a)+(4b) $n^2\hat{s}\times\left(\hat{s}\times\vec{E}\right) + c^2\mu\bar{\varepsilon}\vec{E} = 0$ (5)

Równanie charakterystyczne $\begin{bmatrix} n_x^2 - n^2\left(1-s_x^2\right) & n^2 s_x s_y & n^2 s_x s_z \\ n^2 s_x s_y & n_y^2 - n^2\left(1-s_y^2\right) & n^2 s_y s_z \\ n^2 s_x s_z & n^2 s_y s_z & n_z^2 - n^2\left(1-s_z^2\right) \end{bmatrix} \cdot \begin{bmatrix} E_x \\ E_y \\ E_z \end{bmatrix} = 0$ (6)

Rozwiązanie (6) $\det\begin{vmatrix} n_x^2 - n^2\left(1-s_x^2\right) & n^2 s_x s_y & n^2 s_x s_z \\ n^2 s_x s_y & n_y^2 - n^2\left(1-s_y^2\right) & n^2 s_y s_z \\ n^2 s_x s_z & n^2 s_y s_z & n_z^2 - n^2\left(1-s_z^2\right) \end{vmatrix} = 0$ (7)

Wartości własne (6)

$$\boxed{\begin{aligned} & n^4 - An^2 + B = 0 \\ & A = \frac{s_x^2\varepsilon_x\left(\varepsilon_y + \varepsilon_z\right) + s_y^2\varepsilon_y\left(\varepsilon_x + \varepsilon_z\right) + s_z^2\varepsilon_z\left(\varepsilon_x + \varepsilon_y\right)}{s_x^2\varepsilon_x + s_y^2\varepsilon_y + s_z^2\varepsilon_z} \\ & B = \frac{\varepsilon_x\varepsilon_y\varepsilon_z}{s_x^2\varepsilon_x + s_y^2\varepsilon_y + s_z^2\varepsilon_z} \end{aligned}} \quad (8)$$

Wektory własne (6)

$$\boxed{\vec{E} = \begin{bmatrix} \frac{s_x}{n^2 - n_x^2} \\ \frac{s_y}{n^2 - n_y^2} \\ \frac{s_z}{n^2 - n_z^2} \end{bmatrix} \quad \vec{D} = \varepsilon_0 \begin{bmatrix} n_x^2 & 0 & 0 \\ 0 & n_y^2 & 0 \\ 0 & 0 & n_z^2 \end{bmatrix} \vec{E} = \varepsilon_0 \begin{bmatrix} \frac{s_x n_x^2}{n^2 - n_x^2} \\ \frac{s_y n_y^2}{n^2 - n_y^2} \\ \frac{s_z n_z^2}{n^2 - n_z^2} \end{bmatrix}} \quad (9)$$