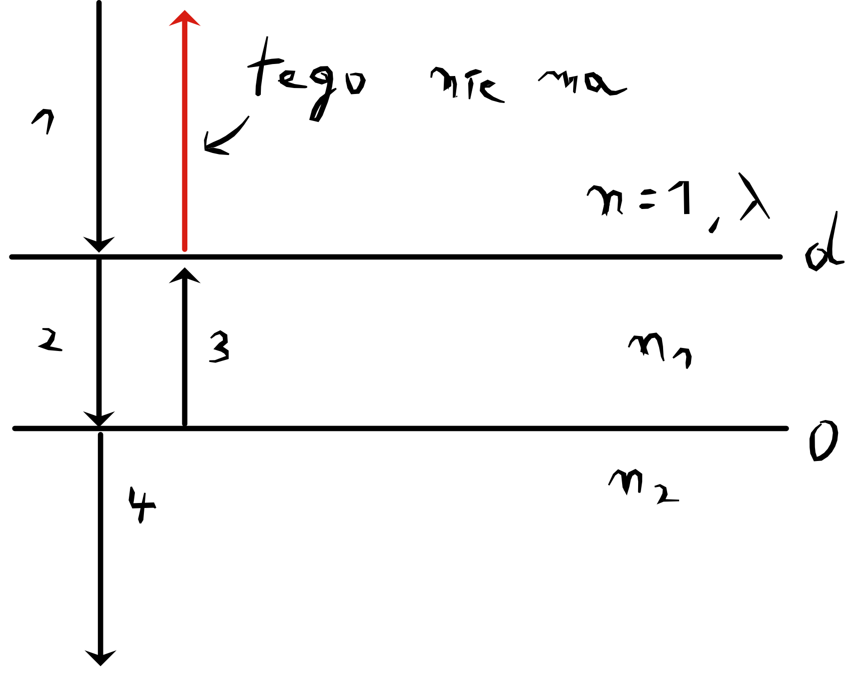

Niech $\bar{E}_i = E_i e^{i(k_i z - \omega t)} \bar{e}_x \quad \omega \bar{B}_i = \bar{k}_i \times \bar{E}_i$

$\bar{E}_1$	$\bar{E}_2$	$\bar{E}_3$	$\bar{E}_4$
$\rightarrow$	$\rightarrow$	$\leftarrow$	$\rightarrow$
$\bar{B}_1$	$\bar{B}_2$	$\bar{B}_3$	$\bar{B}_4$
$\odot$	$\odot$	$\odot$	$\odot$

$k = \frac{2\pi}{\lambda}$

$\frac{\omega}{k_i} = \frac{c}{n_i}$

$\frac{k_i}{k_j} = \frac{n_i}{n_j}$

1) $E_{\parallel}$ 2) $D_{\perp}$ 3) $B_{\perp}$ 4) $H_{\parallel}$ E_1 pada, więc je znamy, niech $T_i = \frac{E_i}{E_1}$ $i \neq 1$

2) i 3) $0=0$, bo mamy składowe tylko równoległe

dla $z=0$

$$\left.\begin{aligned} &1)\ E_4 = E_2 - E_3 \\ &4)\ k_2 E_4 = k_1 E_2 + k_1 E_3 \Rightarrow \frac{n_2}{n_1} E_4 = E_2 + E_3 \end{aligned}\right\} \begin{aligned} 2T_2 &= T_4\left(1 + \frac{n_2}{n_1}\right) \\ 2T_3 &= T_4\left(\frac{n_2}{n_1} - 1\right) \end{aligned} \qquad \frac{T_2}{T_3} = \frac{n_2+n_1}{n_2-n_1}$$

dla $z=d$

1) $E_1 e^{ikd} = E_2 e^{ik_1 d} - E_3 e^{-ik_1 d} \Rightarrow e^{ikd} = T_2 e^{ik_1 d} - T_3 e^{-ik_1 d}$

4) $k E_1 e^{ikd} = k_1 E_2 e^{ik_1 d} + k_1 E_3 e^{-ik_1 d} \Rightarrow \frac{1}{n_1} e^{ikd} = T_2 e^{ik_1 d} + T_3 e^{-ik_1 d}$

$$\frac{1}{n_1}\left(T_2 e^{ik_1 d} - T_3 e^{-ik_1 d}\right) = T_2 e^{ik_1 d} + T_3 e^{-ik_1 d}$$

$$T_2\left(\frac{1}{n_1} - 1\right) e^{ik_1 d} = T_3\left(1 + \frac{1}{n_1}\right) e^{-ik_1 d}$$

$$\frac{T_2}{T_3} = \frac{1+n_1}{1-n_1} e^{-2ik_1 d} \qquad \boxed{\frac{1+n_1}{1-n_1} e^{-2ik_1 d} = \frac{n_2+n_1}{n_2-n_1}}$$

1) $e^{-2ik_1 d} = 1$

$$\frac{1+n_1}{1-n_1} = \frac{n_2+n_1}{n_2-n_1}$$

$\Rightarrow n_1 = 0$

nie fizyczne

2) $e^{-2ik_1 d} = -1$

$$\frac{1+n_1}{n_1-1} = \frac{n_2+n_1}{n_2-n_1}$$

$\Rightarrow n_1 = \sqrt{n_2}$

$-2ik_1 d = i\pi(2m+1)$ $\qquad d = \frac{\lambda}{n_1}\left(\frac{1}{4} + \frac{m}{2}\right)$

$$\frac{4d}{\lambda_1} = (2m+1)$$

$$d = \frac{\lambda}{n_1}\left(\frac{1}{4} + \frac{m}{2}\right)$$