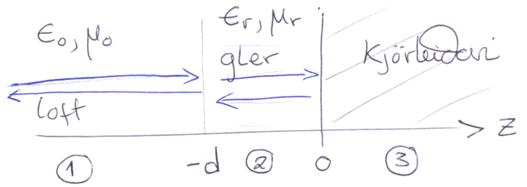
1

Flöt rafsegulbylgja með bylgjulengd λ fellur á spegil:

$$\beta_0 = \frac{2\pi}{\lambda}$$



$\epsilon_r = 3.0$

$\mu_r = 1,0$

Veljum

$$\bar{E}_1 = \hat{a}_x \left\{ E_{i0} e^{i\beta_0 z} + E_{r0} e^{-i\beta_0 z} \right\}$$

$$\bar{H}_1 = \hat{a}_y \frac{1}{\eta_0} \left\{ E_{i0} e^{i\beta_0 z} - E_{r0} e^{-i\beta_0 z} \right\}$$

$$\bar{E}_2 = \hat{a}_x \left\{ E_2^+ e^{i\beta_2 z} + E_2^- e^{-i\beta_2 z} \right\}$$

$$\bar{H}_2 = a_y \frac{1}{\eta_2} \left\{ E_2^+ e^{ik_2 z} - E_2^- e^{-i\beta_2 z} \right\}$$

2

Engin segulvirkni í glerplötunni, $\mu_r = 1$

því eru jaðarskilyrðin

$$E_{1t} = E_{2t} \quad \text{og} \quad \hat{a}_{n_2} \times (\bar{H}_1 - \bar{H}_2) = \bar{J}_s$$

Í $z = -d$ þýðir það

$$\bar{E}_1(-d) = \bar{E}_2(-d)$$

$$\bar{H}_1(-d) = \bar{H}_2(-d) \leftarrow$$ því enginn yfirborðsstraumur myndast í $z = -d$

Í $z = 0$ gildir

$$\bar{E}_2(0) = 0 \leftarrow$$ því $E = 0$ inni í leiðara

$$-\hat{a}_z \times \bar{H}_2 = \bar{J}_s \leftarrow$$ er yfirborðsstraumur á leiðara

3

Í $z = -d$

$$E_{i0} e^{-i\beta_0 d} + E_{r0} e^{i\beta_0 d} = E_2^+ e^{-i\beta_2 d} + E_2^- e^{i\beta_2 d}$$

$$\frac{E_{i0} e^{-i\beta_0 d} - E_{r0} e^{i\beta_0 d}}{\eta_0} = \frac{E_2^+ e^{-i\beta_2 d} - E_2^- e^{i\beta_2 d}}{\eta_2}$$

Í $z = 0$

$$E_2^+ + E_2^- = 0$$, hugsum okkur E_{i0} gefið

$$\rightarrow \quad E_{i0} e^{-i\beta_0 d} + E_{r0} e^{i\beta_0 d} = E_2^+ \left\{ e^{-i\beta_2 d} - e^{i\beta_2 d} \right\}$$

$$\eta_2 \left\{ E_{i0} e^{-i\beta_0 d} - E_{r0} e^{i\beta_0 d} \right\} = \eta_0 E_2^+ \left\{ e^{-i\beta_2 d} + e^{i\beta_2 d} \right\}$$

4

$$E_{r0} e^{i\beta_0 d} - E_2^+ \left\{ e^{-i\beta_2 d} - e^{i\beta_2 d} \right\} = -E_{i0} e^{-i\beta_0 d}$$

$$-\eta_2 E_{r0} e^{i\beta_0 d} - \eta_0 E_2^+ \left\{ e^{-i\beta_2 d} + e^{i\beta_2 d} \right\} = -\eta_2 E_{i0} e^{-i\beta_0 d}$$

$$\begin{pmatrix} e^{i\beta_0 d} & -\left\{ e^{-i\beta_2 d} - e^{i\beta_2 d} \right\} \\ -\eta_2 e^{i\beta_0 d} & -\eta_0 \left\{ e^{-i\beta_2 d} + e^{i\beta_2 d} \right\} \end{pmatrix} \begin{pmatrix} E_{r0} \\ E_2^+ \end{pmatrix} = \begin{pmatrix} -E_{i0} e^{-i\beta_0 d} \\ -\eta_2 E_{i0} e^{-i\beta_0 d} \end{pmatrix}$$

(5)

$$E_{r0} = \frac{\eta_0 e^{-i\beta_0 d}\left\{e^{-i\beta_2 d} + e^{i\beta_2 d}\right\} - \eta_2 e^{-i\beta_0 d}\left\{e^{-i\beta_2 d} - e^{i\beta_2 d}\right\}}{\eta_2 e^{i\beta_0 d}\left\{e^{-i\beta_2 d} - e^{i\beta_2 d}\right\} + \eta_0 e^{i\beta_0 d}\left\{e^{-i\beta_2 d} + e^{i\beta_2 d}\right\}} E_{i0}$$

$$E_2^+ = \frac{2\eta_2}{\eta_2 e^{i\beta_0 d}\left\{e^{-i\beta_2 d} - e^{i\beta_2 d}\right\} + \eta_0 e^{i\beta_0 d}\left\{e^{-i\beta_2 d} + e^{i\beta_2 d}\right\}} E_{i0}$$

Umritum

$$E_{r0} = \frac{e^{-2i\beta_0 d}\left\{\eta_0 \cos(\beta_2 d) + \eta_2 i \sin(\beta_2 d)\right\}}{\eta_0 \cos(\beta_2 d) - \eta_2 i \sin(\beta_2 d)} E_{i0}$$

$\beta_0 = \frac{2\pi}{\lambda}$ $\qquad$ $\eta_2 = \sqrt{\frac{\mu_r \mu_0}{\epsilon_r \epsilon_0}} = \frac{120\pi}{\sqrt{3}}$ hér

$\eta_0 = \sqrt{\frac{\mu_0}{\epsilon_0}} \simeq 120\pi \ (\Omega)$ $\qquad$ $\beta_2 = \beta_0 \sqrt{\epsilon_r} = \sqrt{3}\beta_0$ hér

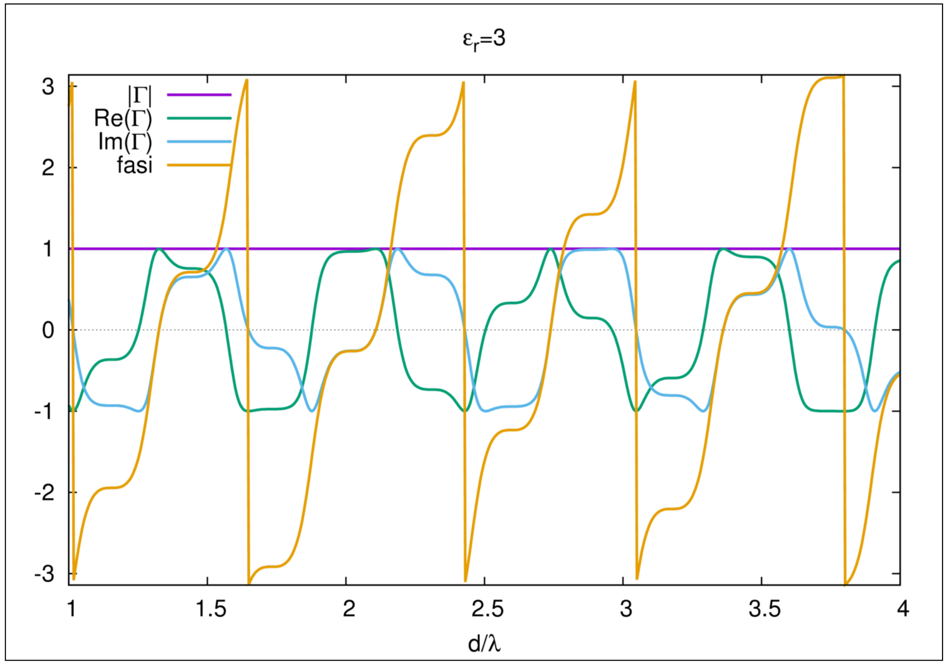
(6)

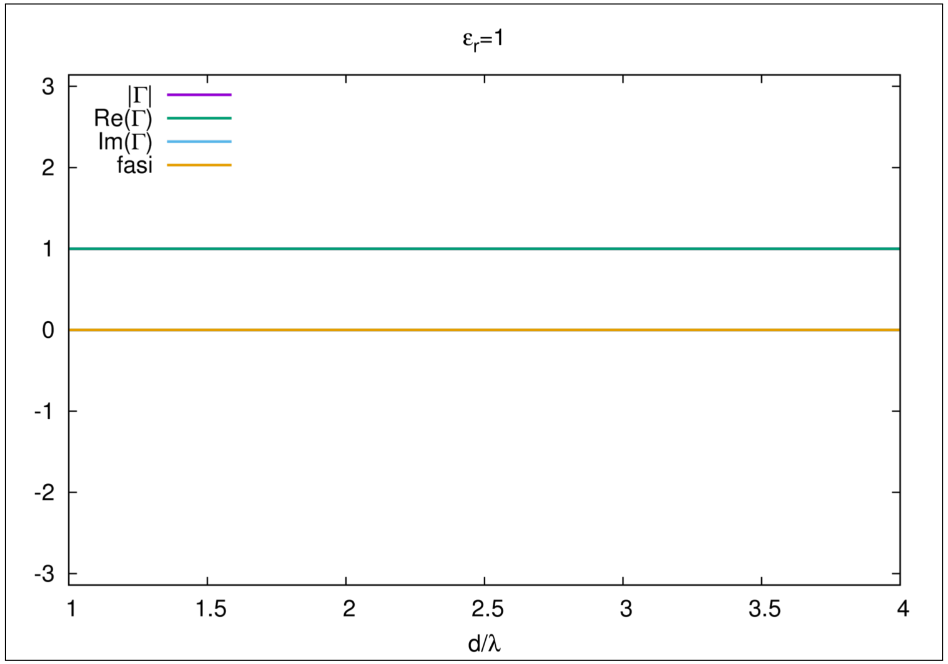
$\beta_0 d = 2\pi \frac{d}{\lambda}$

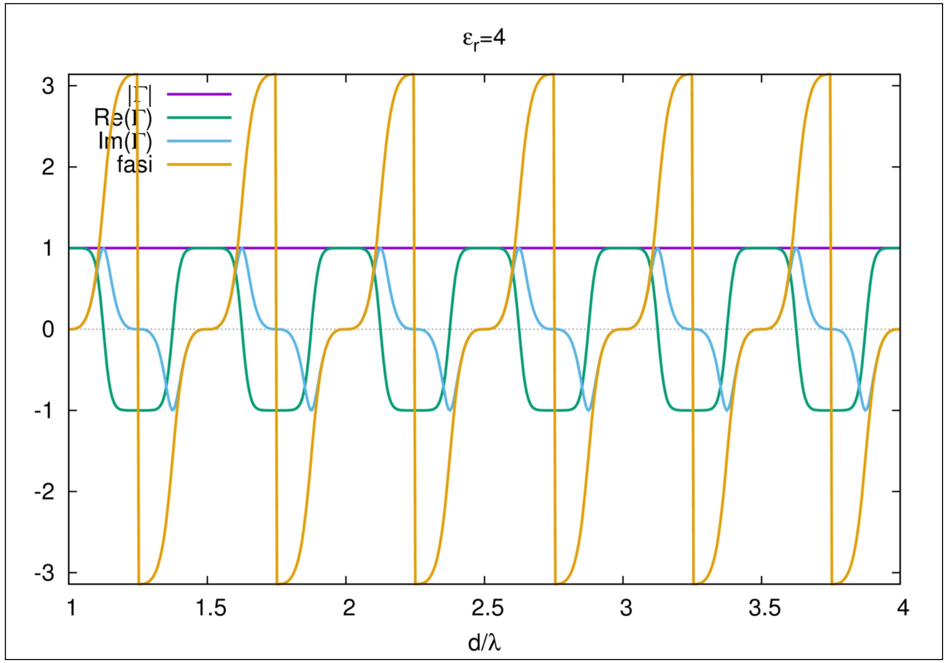
$\beta_2 d = 2\pi \frac{d}{\lambda}\sqrt{3}$, $\qquad \Gamma = \frac{E_{r0}}{E_{i0}}$

Könnum líka fasahornið milli $Re(\Gamma)$ og $Im(\Gamma)$

Ég geri myndir fyrir $\epsilon_r = 3.0$, 4.0, 1.0







ε_r=4
|Γ|
Re(Γ)
Im(Γ)
fasi
3
2
1
0
-1
-2
-3
1
1.5
2
2.5
3
3.5
4
d/λ