Suppose lossless medium. ($\sigma = 0$, both)

The net $\vec{E}$ feild in ①

$$\vec{E}_{is} + \vec{E}_{rs} = \hat{x} E_i e^{-\alpha_1 z} e^{-j\beta_1 z} + \hat{x} \Gamma E_i e^{+\alpha_1 z} e^{+j\beta_1 z}$$

$\sigma_1 = 0 \quad \therefore \quad \alpha_1 = 0$

The physical feild in medium 1 becomes

$$\mathrm{Re}\left[\hat{x} E_i \left(e^{-j\beta_1 z} e^{j\omega t} + \Gamma e^{j\beta z} e^{j\omega t} \right) \right]$$

$$\hat{x} E_i \,\mathrm{Re}\Big[\cos(\omega t - \beta_1 z) + j\sin(\omega t - \beta_1 z) + \Gamma\cos(\omega t + \beta_1 z) + \Gamma j\sin(\omega t + \beta_1 z) \Big]$$

If $\sigma_1 = \sigma_2 = 0$ then $\alpha_1 = \alpha_2 = 0$

then gamma is real (Γ)

$$\hat{x} E_i \left[\cos(\omega t - \beta_1 z) + \Gamma \cos(\omega t + \beta_1 z) \right]$$

Suppose $\Gamma = -1 \quad (\eta_1 >>>>> \eta_2)$

$$\hat{x} E_i (\cos(\omega t - \beta_1 z) - \cos(\omega t + \beta_1 z))$$

can be 0 when

$$\omega t - \beta_1 z = \omega t + \beta_1 t \pm 2\pi n$$

(dialectric to dialectric boundry)

Dialectric - Conductor Boundry

$\Downarrow$ incedent med

$\sigma_1 = 0$

$\alpha_1 = 0$

$\Downarrow$

$\sigma_2 = \infty$

$\alpha_2 = \infty$

$\eta = 0$

$$\vec{E}_{is} = \hat{x} E_i \cancel{e^{-\alpha_2 z}}^{\,0} e^{-j\beta_2 z}$$

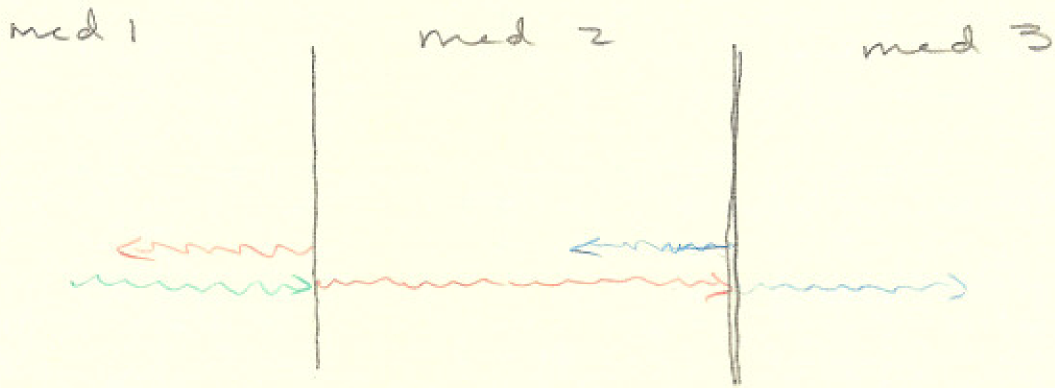
note all electric feild is reflected.

$$\tau = \frac{2\eta_{c2}}{\eta_{c1} + \eta_{c2}} = 0$$ (nothing is trans..)

$$\Gamma = -1$$ (everything is reflected)

note if Γ is greater then zero then the electric feild is positive w.r.t. the E_i, if $\Gamma < 0$ then neg w.r.t. E_i

Multiple interfaces



E_i is net incident feild ...

E_{r1} is net reflected feild in.

in med (1) (includes back scatter)

E_2^+ is the net feild towards right

E_2^- is the net feild towards left

med (2)

E_{3t} is the net transmitted feild — med (3)

$$\vec{H}_{i1} = \frac{1}{\eta_{c1}}(\hat{z}) \times \hat{x}\left(E_i e^{-\alpha_1 z} e^{-j\beta_1 z}\right)$$

$$\vec{H}_{r1} = \frac{1}{\eta_{c1}}(-\hat{z}) \times \hat{x}\left(E_i e^{+\alpha_1 z} e^{+j\beta_1 z}\right)$$

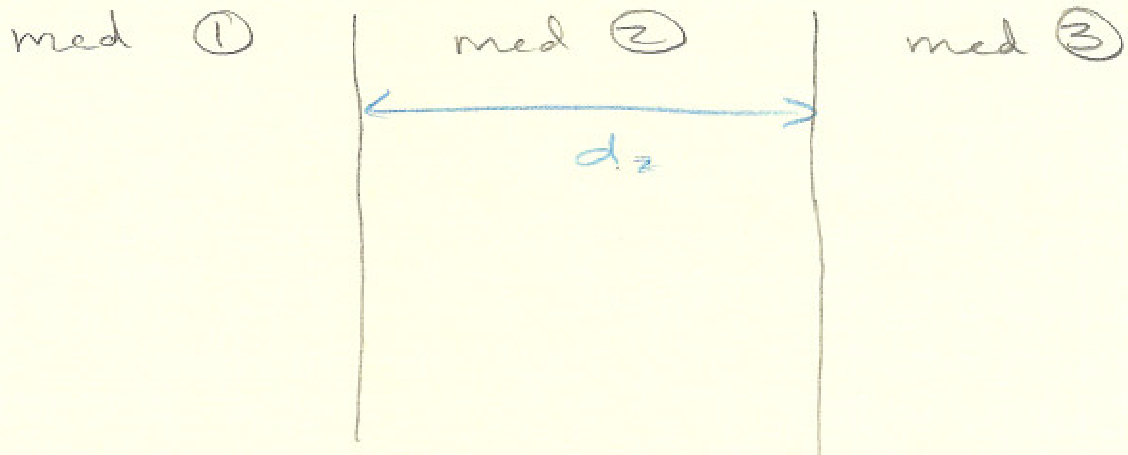
$$\vec{H}_{1net} = \frac{1}{\eta_{c1}}\hat{y}\left(E_i e^{-\alpha_1 z} e^{-j\beta_1 z} - E_r e^{+\alpha_1 z} e^{+j\beta_1 z}\right)$$

$$\vec{H}_2 = \frac{1}{\eta_{c2}} \hat{y} \left(E_2^+ e^{-\alpha_2 z} e^{-j\beta_2 z} + E_2^- e^{+\alpha_2 z} e^{+j\beta z} \right)$$

$$\vec{E}_{3t} = \hat{x} E_3^+ e^{-\alpha_3 z} e^{-j\beta_3 z}$$

$$\vec{H}_{3t} = \frac{1}{\eta_{c3}} \hat{y} E_3^+ e^{-\alpha_3 z} e^{-j\beta_3 z}$$

4 equ for 5 unknowns, but we have E_i



$$\frac{E_r}{E_i} = \frac{(\eta_{c2} - \eta_{c1})(\eta_{c2} + \eta_{c3}) + e^{-2\gamma_2 d_2}(\ldots}{(\eta_{c1} + \eta_{c2})(\eta_{c2} + \eta_{c3}) + e^{-2\gamma_2 d_2}(\ldots}$$

$$\frac{E_3^+}{E_i} = \_\_\_$$

See distributed notes for these and more (eqn 10.13 → 10.16)