ε' $\quad\sigma$

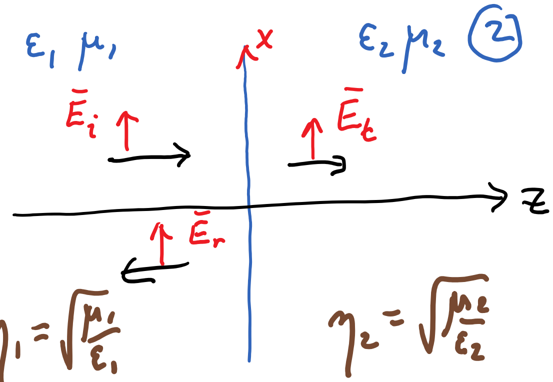
$\eta_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}} \simeq 377\ \Omega$

$\eta = \sqrt{\frac{\mu}{\varepsilon_c}}$

$e^{-j\beta z}$

$k_1 = \omega\sqrt{\mu_1\varepsilon_1}$ $\qquad k_2 = \omega\sqrt{\mu_2\varepsilon_2}$

1 $\ \varepsilon_1\ \mu_1$ $\qquad \varepsilon_2\ \mu_2$ 2



$\eta_1 = \sqrt{\frac{\mu_1}{\varepsilon_1}}$ $\qquad \eta_2 = \sqrt{\frac{\mu_2}{\varepsilon_2}}$

$z = 0$

$$\bar{E}_i(z) = \bar{a}_x E_{io}\, e^{-jk_1 z}$$

$$\bar{H}_i(z) = \bar{a}_y \frac{E_{io}}{\eta_1} e^{-jk_1 z}$$

$$\bar{E}_r(z) = \bar{a}_x E_{ro}\, e^{+jk_1 z}$$

$$\bar{H}_r(z) = -\bar{a}_y \frac{E_{ro}}{\eta_1} e^{+jk_1 z}$$

$$\bar{E}_t(z) = \bar{a}_x E_{to}\, e^{-jk_2 z}$$

$$\bar{H}_t(z) = \bar{a}_y \frac{E_{to}}{\eta_2} e^{-jk_2 z}$$

$$\bar{E}_{1_{tan}} = \bar{E}_{2_{tan}} \quad (z=0)$$

$$\bar{H}_{1_{tan}} = \bar{H}_{2_{tan}} \quad (z=0) \rightarrow e^{-jkz} = 1$$

BOUNDARY CONDITION

$$E_{io} + E_{ro} = E_{to} = \frac{\eta_2}{\eta_1} E_{io} - \frac{\eta_2}{\eta_1} E_{ro}$$

$$\frac{E_{io}}{\eta_1} - \frac{E_{ro}}{\eta_1} = \frac{E_{to}}{\eta_2}$$

$$\Rightarrow E_{ro}\left(1 + \frac{\eta_2}{\eta_1}\right) = E_{io}\left(-1 + \frac{\eta_2}{\eta_1}\right)$$

$$E \;=\; \eta_2 - \eta_1$$

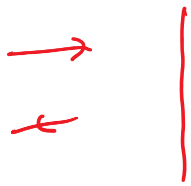
$$E_{r_0} = \frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} E_{i0} = \Gamma E_{i0}$$

REFLECTION COEFFICIENT

$$E_{t_0} = \underbrace{\frac{2\eta_2}{\eta_2 + \eta_1}}_{\tau} E_{i0}$$

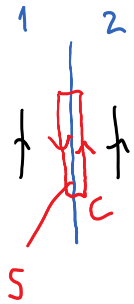
$\leftarrow$ TRANSMISSION COEFFICIENT

$$\eta_2 = 0 \Rightarrow \Gamma = \frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} = -1$$



$$e^{-jk_1 z} - e^{+jk_1 z} = -2j \sin k_1 z$$

$$\mathrm{Re}\{-2j \sin k_1 z \, e^{j\omega t}\} = 2 \sin k_1 z \sin \omega t$$



$$\nabla \times \bar{E} = -j\omega \bar{B}$$

$$\int \nabla \times \bar{E} \cdot d\bar{S} = \oint \bar{E} \cdot d\bar{l} = -j\omega \int \bar{B} \cdot d\bar{S} = 0$$

$$\bar{E}_2 \cdot d\bar{l} = -\bar{E}_1 \cdot d\bar{l}$$

$$E_{1_{tan}} = E_{2_{tan}}$$