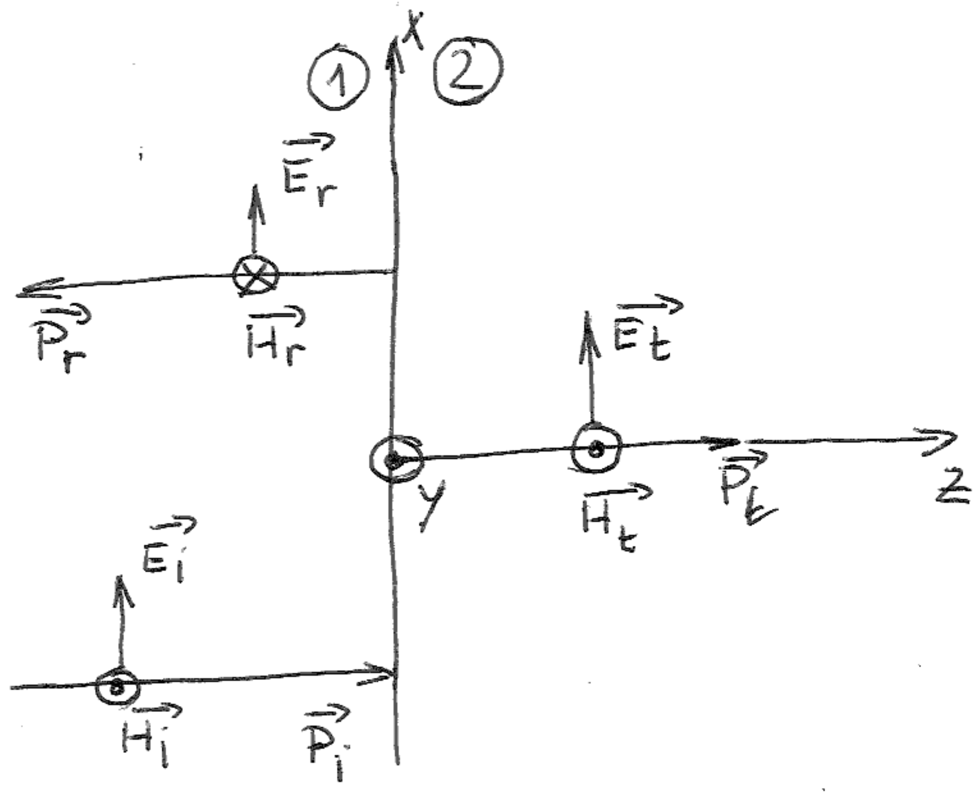
INCIDENCIA NORMAL. CASO GENERAL



$\mu_1, \epsilon_1, \sigma_1$ $\qquad$ $\mu_2, \epsilon_2, \sigma_2$

$$\vec{E}_i = \hat{x}\, E_{i_1}\, e^{-\gamma_1 z} \qquad \text{CON } \gamma_1 = \alpha_1 + j\beta_1$$

$$\vec{E}_r = \hat{x}\, E_{r1}\, e^{\gamma_1 z}$$

EL CAMPO TOTAL EN EL MEDIO 1

$$\vec{E}_1 = \hat{x}\, E_{i1}\, e^{-\gamma_1 z} + \hat{x}\, E_{r1}\, e^{\gamma_1 z}$$

$$\vec{H}_1 = \hat{y}\, \frac{E_{i1}}{Z_1} e^{-\gamma_1 z} - \hat{y}\, \frac{E_{r1}}{Z_1} e^{\gamma_1 z}$$

ES ANALOGO AL CASO VISTO DIEL PERFECTO – DIEL PERFECTO.

$$\vec{E_t} = \hat{x} E_{t1} e^{-\gamma_2 z}$$

$$\vec{H_t} = \hat{y} \frac{E_{t1}}{Z_2} e^{-\gamma_2 z}$$

DONDE

$$Z_2 = \sqrt{\frac{j\omega\mu_2}{\sigma_2 + j\omega\epsilon_2}} \qquad \gamma_2 = \sqrt{j\omega\mu_2(\sigma_2 + j\omega\epsilon_2)}$$

EL COEFIENTE DE REFLEXION ES:

$$\Gamma = \frac{E_{r1}}{E_{i1}}$$

Y EL COEFICIENTE DE TRANSMISIÓN ES:

$$T = \frac{E_{t1}}{E_{i1}}$$

POR LO TANTO

$$\vec{E_1} = \hat{x} E_{i1} e^{-\gamma_1 z} + \hat{x} \Gamma E_{i1} e^{\gamma_1 z}$$

$$\vec{H_1} = \hat{y} \frac{E_{i1}}{Z_1} e^{-\gamma_1 z} - \hat{y} \frac{E_{i1} \Gamma}{Z_1} \cdot e^{\gamma_1 z}$$

APLICANDO LAS CONDICIONES DE BORDE EN $Z=0$.

$$E_{tang_1} = E_{tang_2}$$

$$H_{tang_1} = H_{tang_2}$$

$$\begin{cases} E_{i1} + \Gamma E_{i1} = E_{t1} = E_{i1} T \\ \dfrac{E_{i1}}{Z_1} - \dfrac{E_{i1}}{Z_1}\Gamma = \dfrac{E_{t1}}{Z_2} = \dfrac{E_{i1} T}{Z_2} \end{cases}$$

SE OBTIENE

$$T = \frac{E_{t1}}{E_{i1}} = \frac{2Z_2}{Z_2 + Z_1} \qquad \Gamma = \frac{Z_2 - Z_1}{Z_2 + Z_1}$$

ANALOGAMENTE AL CASO ~~D~~ DE DIEL. PERF. AUNQUE AQUI Z_1, Z_2 SERÁN COMPLEJAS

$$\vec{E}_1(z) = \vec{E}_1 = E_{i1} e^{-\gamma_1 z}\hat{x} + \Gamma E_{i1} e^{\gamma_1 z}\hat{x}$$

SUMANDO Y RESTANDO $\Gamma E_{i1} e^{-\gamma_1 z}$

$$\vec{E}_1 = \hat{x} E_{i1}\left[(1+\Gamma)e^{-\gamma_1 z} + \Gamma\left(e^{\gamma_1 z} - e^{-\gamma_1 z}\right)\right]$$

COMO $e^{\gamma_1 z} - e^{-\gamma_1 z} = 2\,\mathrm{senh}(\gamma_1 z) = -2j\,\mathrm{sen}(j\gamma_1 z)$

$$1 + \Gamma = T$$

$$\boxed{\vec{E}_1 = \hat{x} E_{i1}\left[T e^{-\gamma_1 z} - 2j\Gamma\,\mathrm{sen}(j\gamma_1 z)\right]}$$

ANALOGAMENTE EL CAMPO MAGNÉTICO:

$$\vec{H}_1 = \hat{y}\frac{E_{i1}}{Z_1}\left[e^{-\gamma_1 z}(1+\Gamma) - \Gamma\left(e^{\gamma_1 z} + e^{-\gamma_1 z}\right)\right]$$

COMO $e^{\gamma_1 z} + e^{-\gamma_1 z} = 2\cosh(\gamma_1 z) = 2\cos(j\gamma_1 z)$

$$\boxed{\vec{H_1} = \hat{y}\frac{E_{i1}}{Z_1}\left[T e^{-\gamma_1 z} - 2\Gamma \cos(j\gamma_1 z)\right]}$$

EL CAMPO EN EL MEDIO 2

$$\vec{E_t} = \hat{x}\, T E_{i1} e^{-\gamma_2 z}$$

$$\vec{H_t} = \hat{y}\, \frac{T E_{i1}}{Z_2} e^{-\gamma_2 z}$$

LOS VECTORES DE POYNTING SON

$$\vec{P_1}^{+} = \left(\hat{x} E_{i1} e^{-\gamma_1 z}\right) \times \left(\hat{y} \frac{E_{i1}}{Z_1} e^{-\gamma_1 z}\right)$$

$$\boxed{\vec{P_1}^{+} = \underbrace{\left(\hat{x} \times \hat{y}\right)}_{\hat{z}} \frac{E_{i1}^2}{Z_1} e^{-2\gamma_1 z}}$$

$$\vec{P_1}^{-} = \left(\hat{x} E_{r1} e^{\gamma_1 z}\right) \times \left(-\hat{y} \frac{E_{r1}}{Z_1} e^{\gamma_1 z}\right)$$

$$\boxed{\vec{P_1}^{-} = -\hat{z}\, \frac{E_{r1}^2}{Z_1} e^{2\gamma_1 z}}$$