

Lect. 25; May 4, 2010

①

# # Reflection and Refraction of EM waves (Ch 24)

Explain: phase change of reflection =  $\pi$

Snell's Law of refraction,  $\sin \theta_c = \frac{n_1}{n_2}$

Stokes's relations on  $r$  and  $t$

Brewster's Law on Polarization:  $\theta_p = \tan^{-1} \frac{n_2}{n_1}$

# Consider the plane wave at the interface of two dielectrics

$$\text{Max Eqs: } \left\{ \begin{array}{l} \textcircled{1} \nabla \cdot \vec{D} = 0 \\ \textcircled{2} \nabla \cdot \vec{B} = 0 \\ \textcircled{3} \nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \\ \textcircled{4} \nabla \times \vec{H} = \frac{\partial \vec{D}}{\partial t} \end{array} \right. \Rightarrow \left\{ \begin{array}{l} \textcircled{1} D_{1n} = D_{2n} \\ \textcircled{2} B_{1n} = B_{2n} \\ \textcircled{3} E_{1t} = E_{2t} \\ \textcircled{4} H_{1t} = H_{2t} \end{array} \right.$$

and

$$\begin{aligned} \vec{D}_1 &= \epsilon_1 \vec{E}_1 \\ \vec{D}_2 &= \epsilon_2 \vec{E}_2 \\ \vec{H}_1 &= \vec{B}_1 / \mu_1 \\ \vec{H}_2 &= \vec{B}_2 / \mu_2 \end{aligned}$$

two media:  $(\epsilon_1, \mu_1)$

$(\epsilon_2, \mu_2)$

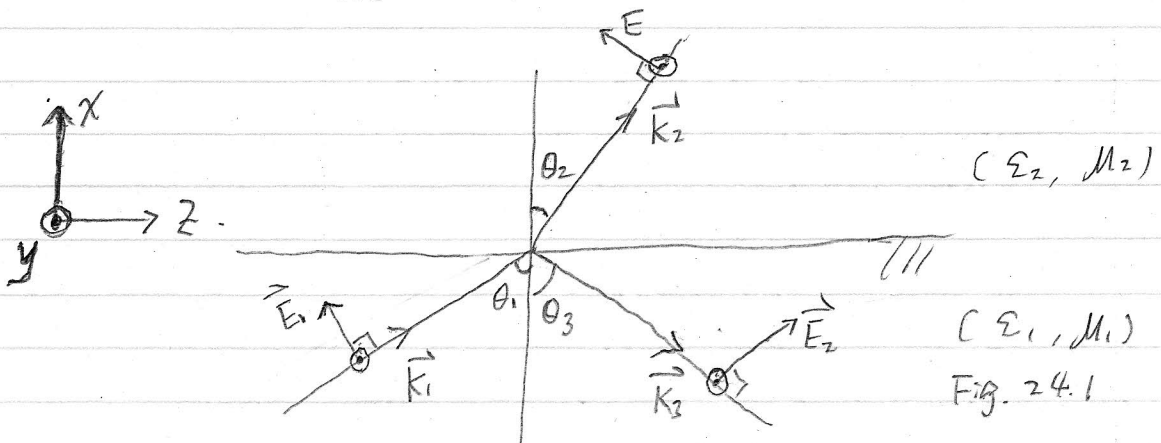


Fig. 24.1

Plane wave:

$$\left\{ \begin{array}{l} \vec{E}_1 = \vec{E}_{10} e^{i(\vec{k}_1 \cdot \vec{r} - \omega t)} \\ \vec{E}_2 = \vec{E}_{20} e^{i(\vec{k}_2 \cdot \vec{r} - \omega t)} \\ \vec{E}_3 = \vec{E}_{30} e^{i(\vec{k}_3 \cdot \vec{r} - \omega t)} \end{array} \right. \quad \text{--- (1)}$$

