$$n = \frac{c_0}{c} = \sqrt{\frac{\varepsilon}{\varepsilon_0}\frac{\mu}{\mu_0}} = \sqrt{\varepsilon_r}$$

$\mu = \mu_0$

$\bar{D} = \varepsilon \bar{E} \qquad \bar{D} = \bar{P} + \varepsilon_0 \bar{E}$

$$-\bar{k}\cdot\bar{k} = -\mu\varepsilon\omega^2 - i\sigma\omega\mu$$

$$|k|^2 = \mu\omega^2\left[\varepsilon_0(1+\chi) + i\frac{\sigma}{\omega}\right] = \mu\tilde{\varepsilon}\omega^2$$

$$N = \sqrt{\tilde{\varepsilon}_r} = n + i\kappa$$

MODEST HAS (−) BUT HE ALSO USES

(+)VE

$$E = E_0 \exp(+i(\omega t - kx))$$

EXTINCTION COEFF

REFRACTIVE INDEX

COMPLEX REFRACTIVE INDEX

SO IF $E_y = E_{y_0} \exp\left[-i\left(\omega t - \frac{N\omega}{c_0}x\right)\right]$

$$= E_{y_0} \exp\left[-i\omega\left(t - \frac{n+i\kappa}{c_0}x\right)\right]$$

$$= E_{y_0} \underbrace{\exp\left(-\frac{\kappa\omega}{c_0}x\right)}_{\text{ATTENUATION TERM.}} \exp\left[-i\omega\left(t - \frac{nx}{c_0}\right)\right]$$

$\cancel{E_y = E_{y_0} \exp[-i(\omega t}$ **POWER**

$$E_y = E_{y_0} \exp\left[-i\omega\left(t - \frac{n+i\varkappa}{c_0} x\right)\right]$$

$$\Rightarrow \quad H_z = \frac{N}{\mu_0 c_0} \exp\left[\quad " \quad \right]$$

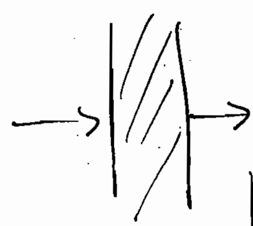
$$\langle \bar{S} \rangle = \frac{1}{2} \mathrm{Re}\left(\bar{E} \times \bar{H}^*\right) = \frac{1}{2} \mathrm{Re} \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ 0 & E_y & 0 \\ 0 & 0 & H_z^* \end{vmatrix} = \frac{1}{2} \mathrm{Re}\left(E_y H_z^*\right) = S_x$$

$$\langle S_x \rangle = \frac{1}{2} \mathrm{Re}\left[E_{y_0} \exp\left(i \frac{Nx}{c_0}\omega\right) \frac{N^*}{\mu_0 c_0} E_{y_0}^* \exp\left(-i \frac{N^* x}{c_0} \omega\right)\right]$$

$$= \frac{|E_{y_0}|^2}{2\mu c_0} \exp\left(\frac{-2\varkappa\omega}{c_0} x\right) = S_0\, e^{-\alpha x} \quad \left[\frac{W}{m^2}\right]$$

$$\alpha = \frac{2\varkappa\omega}{c_0} = \frac{4\pi\varkappa}{\lambda}$$

$$\frac{1}{\alpha} \equiv \delta \quad \text{"SKIN DEPTH}$$

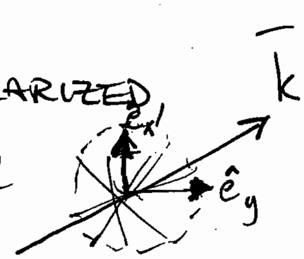


$$\dot{Q} = -\frac{dS_x}{dx} \left(-\bar{\nabla} \cdot \bar{S}\right)$$

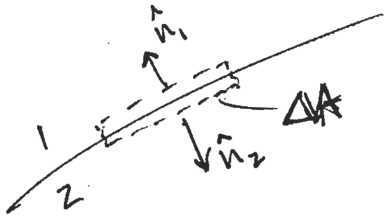
$$\boxed{\dot{Q} = \alpha S_0 e^{-\alpha x}}$$

POLARIZATION

- CAN CALCULATE USING STOKES PARAMETERS
- THERMAL RADIATION IS TYPICALLY RANDOMLY POLARIZED, SUCH THAT WE COMPUTE IT 50-50 USING 2 ORTHOGONAL COMPONENTS



INTERFACE CONDITIONS



$$\overline{\nabla} \cdot \overline{D} = \rho$$

$$\int_{V} dV (\overline{\nabla} \cdot \overline{D}) = \int_{V} \rho \, dV$$

$$\int_{A} \overline{D} \cdot d\overline{A} = \rho_{SURFACE} \cdot \Delta A$$

$$\Longrightarrow \quad \overline{D}_1 \cdot \overline{n} - \overline{D}_2 \cdot \overline{n} = \rho_{SURF}$$

ALSO $\quad \hat{n} \cdot \overline{B}_1 = \overline{B}_2 \cdot \hat{n}$

$$(\overline{E}_1 - \overline{E}_2) \times \overline{n} = 0$$

$$(\overline{H}_1 - \overline{H}_2) \times \hat{n} = \overline{J}_s$$