250

Gauss: $\oiint_E \vec{E} \cdot d\vec{A} = \frac{Q_{enc}}{\varepsilon_0}$

$= 0$ if $Q = 0$

M $\oiint \vec{B} \cdot d\vec{A} = 0$

Ampere: $\oint \vec{B} \cdot d\vec{s} = \mu_0 I_c + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

Faraday: $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_m}{dt}$

$\oint B \cdot ds$

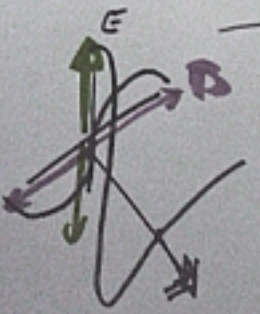
$\mu_0 I_C + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

Faraday: $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_M}{dt}$

TEM $\begin{bmatrix} \vec{E} \\ \vec{B} \end{bmatrix} = \begin{bmatrix} E_m \\ B_m \end{bmatrix} \cos(kz - \omega t) \begin{bmatrix} \hat{x} \\ \hat{y} \end{bmatrix}$

$\frac{E_m}{B_m} = C \qquad \frac{E}{B} = C$

$\mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$



$\frac{d\Phi_M}{dt} \rightarrow E$

$\frac{d\Phi_E}{dt} \rightarrow B$

$$u_E = \frac{1}{2}\varepsilon_0 E^2$$

$$\langle u_E \rangle = \frac{1}{2}\varepsilon_0 E_m^2 \langle \cos^2(\omega t) \rangle$$

$$\frac{1}{2}$$

$$\langle u_E \rangle = \frac{1}{4}\varepsilon_0 E_m^2$$

$$u_M = \frac{B^2}{2\mu_0}$$

$$\langle u_M \rangle = \frac{1}{2\mu_0} B_m^2 \langle \cos^2(\omega t) \rangle$$

$$\frac{1}{2}$$

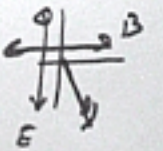
$$\langle u_M \rangle = \frac{1}{4\mu_0} B_m^2$$

$$\langle u \rangle = \langle u_E \rangle + \langle u_M \rangle \quad *$$

$$= \frac{\varepsilon_0 E^2}{2}$$

Poynting Vector

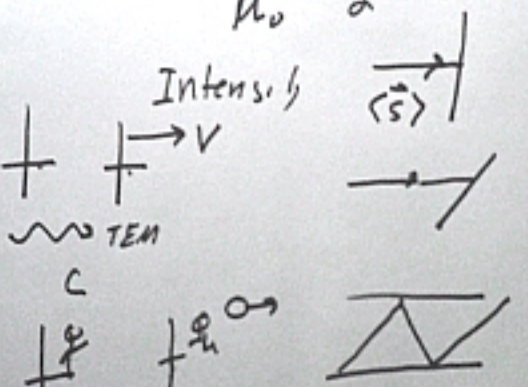
$$\vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$$



$$[S] = \frac{J}{s\,m^2}$$

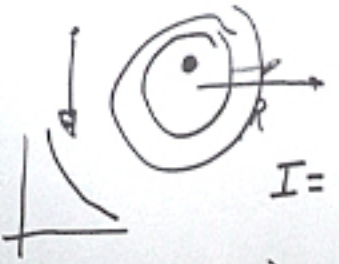
$$\vec{S} = \frac{E_m B_m}{\mu_0} \cos^2(kz - \omega t)\,\hat{z}$$

$$\langle \vec{S} \rangle = \frac{E_m B_m}{\mu_0} \cdot \frac{1}{2} \hat{z}$$



$$\mu_0 c = \sqrt{\frac{\mu_0}{\varepsilon_0}} \Rightarrow c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$$

$$I = \langle \vec{S} \rangle \cdot \hat{n} = c \langle u \rangle$$



$$\frac{E_m}{B_m} = c$$

$$I = \frac{\langle \text{Power} \rangle}{4\pi R^2}$$

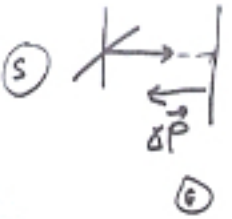
$$\Longrightarrow$$

$$c \, \frac{1}{2} \varepsilon_0 E_m^2 = \frac{\langle \text{Power} \rangle}{4\pi R^2} \qquad c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$$

$$R = 3.5 \text{ m} \qquad B_m = \frac{E_m}{c}$$

$$E_m = \sqrt{\frac{2}{\varepsilon_0 \varepsilon_0} \frac{800 W}{4\pi \cdot 3.5^2} \cdot 3 \times 10^8}$$

$$E_m = 62.6 \frac{V}{m} \quad \text{?} \quad 8 \times 10^{-12}$$



$$F = \frac{dP}{dt}$$

$$\text{Presgura} = \frac{\text{Force}}{\text{Area}} = \frac{(dP/dt)}{\text{Area}}$$

$$\Delta P = \langle U \rangle \cdot A \cdot \Delta t$$

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$$\frac{U}{c} = P$$