$$\text{Intensity} = (\text{Energy Density})(\text{Wave Velocity})$$

Mech. Wave

$$I = \frac{1}{2} \rho \omega^2 A^2 v$$

EM Wave

$$I = \left(\frac{1}{2} \epsilon_0 E_0^2\right) c = \left(\frac{B_0^2}{2\mu_0}\right) c$$

$$E_0 = c B_0$$

Q $\vec{E} = (10^4 \text{ V/m}) \sin(\omega t \oplus k y)\ \hat{k}$

$\vec{B} = \left(\frac{10^{-4}}{3} \text{ T}\right) \sin(\omega t + k y)(-\hat{i})$

① $C = \frac{E}{B}$

$B = \frac{E}{C} = \frac{10^4}{3\times10^8} = \frac{10^4}{3}$

② Dir of wave prop. $= \hat{0}\,[-\hat{y}]$

③ $\text{Dir}(\vec{v}) = \text{Dir}(\vec{E} \times \vec{B})$

$-\hat{j} = \hat{k} \times (-\hat{i})$

[vacuum]

$v = \frac{C}{\sqrt{\epsilon_r \mu_r}}$

$v = \frac{3\times10^8}{\sqrt{2.25\times4}} = 10^8 \text{ m/s}$

freq → same

$v \to \frac{c}{3}$

$\lambda \to \frac{\lambda_0}{3}$

Displacement Current

$$q = CV$$

$$\boxed{i = C\,\frac{dV}{dt}}$$

$$\frac{E_0 B_0}{\mu_0}$$

$$[100\,\omega]\ \frac{3}{100}$$

$$\frac{\eta P}{4\pi r^2} = \left(\frac{1}{2}\epsilon_0 E_0^{\,2}\right) C$$