Apuntes de electromagnetismo: relación entre E y B

Ecuaciones de Maxwell:

I $\nabla \cdot E = \dfrac{\rho}{\varepsilon_0}$ **Ley de Gauss en electricidad**

II $\nabla \cdot E + \dfrac{\partial B}{\partial t} = 0$ **Ley de Inducción de Faraday**

III $\nabla \cdot B = \mathbf{0}$ **Ley de Gauss en magnetismo**

IV $\nabla \cdot B - \dfrac{1}{C^2} \cdot \dfrac{\partial B}{\partial t} = \mu_0$ **Ley de Ampère-Maxwell**

Operador diferencial ∇: $\nabla = \dfrac{\partial}{\partial x}\mathbf{i} + \dfrac{\partial}{\partial y}\mathbf{j} + \dfrac{\partial}{\partial z}\mathbf{k}$

Gradiente: $\nabla\Phi = \dfrac{\partial\Phi}{\partial x}\mathbf{i} + \dfrac{\partial\Phi}{\partial y}\mathbf{j} + \dfrac{\partial\Phi}{\partial z}\mathbf{k}$

Divergencia: $\nabla \cdot \mathbf{V} \Rightarrow \left(\dfrac{\partial}{\partial x}\mathbf{i} + \dfrac{\partial}{\partial y}\mathbf{j} + \dfrac{\partial}{\partial z}\mathbf{k} \right)\left(V_1 i + V_2 j + V_3 k\right) \Rightarrow$

$\nabla \cdot \mathbf{V} = \dfrac{\partial V_1}{\partial x}\mathbf{i} + \dfrac{\partial V_2}{\partial y}\mathbf{j} + \dfrac{\partial V_3}{\partial z}\mathbf{k}$

Rotacional: $\nabla \wedge \mathbf{V} \Rightarrow \nabla \wedge \mathbf{V} = \left(\dfrac{\partial}{\partial x}\mathbf{i} + \dfrac{\partial}{\partial y}\mathbf{j} + \dfrac{\partial}{\partial z}\mathbf{k} \right) \wedge \left(V_1 i + V_2 j + V_3 k\right) \Rightarrow$

$\nabla \wedge \mathbf{V} = \begin{vmatrix} i & j & k \\ \dfrac{\partial}{\partial x} & \dfrac{\partial}{\partial y} & \dfrac{\partial}{\partial z} \\ V_1 & V_2 & V_3 \end{vmatrix}$ Como : $\bar{E} = E_0$ Cos (kx - wt), y $\bar{B} = B_0$ Cos (kx - wt) $\Rightarrow$

texto

$\dfrac{dE}{dx}$ = - k·E Sen (kx - wt), y $\dfrac{dB}{dt}$ = - w·B Sen (kx - wt). Por la 2ª Ley de Maxwell:

$$\nabla \wedge \mathbf{E} = \begin{vmatrix} i & j & k \\ \dfrac{\partial}{\partial x} & \dfrac{\partial}{\partial y} & \dfrac{\partial}{\partial z} \\ E_1 & E_y & E_z \end{vmatrix} \Rightarrow \begin{vmatrix} i & j & k \\ \dfrac{\partial}{\partial x} & \dfrac{\partial}{\partial y} & \dfrac{\partial}{\partial z} \\ 0 & E_y & 0 \end{vmatrix} = \mathbf{i} \cdot \begin{vmatrix} \dfrac{\partial}{\partial y} & \dfrac{\partial}{\partial_z} \\ E_y & 0 \end{vmatrix} - \mathbf{j} \cdot \begin{vmatrix} \dfrac{\partial}{\partial x} & \dfrac{\partial}{\partial_z} \\ 0 & 0 \end{vmatrix} +$$

$$+\mathbf{k} \cdot \begin{vmatrix} \dfrac{\partial}{\partial x} & \dfrac{\partial}{\partial_y} \\ 0 & E_y \end{vmatrix} = \mathbf{i} \cdot \mathbf{0} - \mathbf{j} \cdot \mathbf{0} + \mathbf{k} \cdot \dfrac{\partial E_y}{\partial x} \Rightarrow \nabla \wedge \mathbf{E} = \dfrac{\partial E}{\partial x}; \ \mathbf{y} \ \dfrac{\partial E}{\partial x} = - \dfrac{\partial B}{\partial t} \Rightarrow$$

k·E Sen (kx - wt) = w·B Sen (kx - wt) $\Rightarrow$ **K·E = w·B** $\Rightarrow \dfrac{E}{B} = \dfrac{2\pi f}{\dfrac{2\pi}{\lambda}} \Rightarrow$

$\dfrac{E}{B} = \lambda \cdot f = c \Rightarrow$ **E = c · B**

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