Física IV

21 setembro 2020

Equações de Maxwell

O conjunto completo

Equações de Maxwell

$$\vec{\nabla} \cdot \vec{D} = \frac{\rho}{\epsilon_0}$$

$$\vec{D} = \kappa \vec{E}$$

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

$$\vec{\nabla} \cdot \vec{B} = 0$$

$$\vec{B} = \mu \vec{H}$$

$$\vec{\nabla} \times \vec{H} = \vec{j}$$

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🤥

$$\overrightarrow{\nabla} \times \overrightarrow{H} = \vec{j}$$

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$$\vec{\nabla} \cdot \vec{j} = -\frac{\partial \rho}{\partial t}$$

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só quando $\frac{\partial \rho}{\partial t} = 0$

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$$\vec{\nabla} \cdot \vec{\nabla} \times \vec{H} = \vec{\nabla} \cdot \vec{j} + \vec{\nabla} \cdot \vec{X}$$

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$$\vec{\nabla} \cdot \vec{\nabla} \times \vec{H} = \vec{\nabla} \cdot \vec{j} + \vec{\nabla} \cdot \vec{X}$$

$$0 = -\frac{\partial \rho}{\partial t} + \vec{\nabla} \cdot \vec{X}$$

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Mas $\dfrac{\rho}{\epsilon_0} = \overrightarrow{\nabla} \cdot \overrightarrow{D}$

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Mas $\frac{\rho}{\epsilon_0} = \vec{\nabla} \cdot \vec{D}$

$$\vec{\nabla} \cdot \vec{X} = \epsilon_0 \vec{\nabla} \cdot \frac{\partial \vec{D}}{\partial t}$$

$$\overrightarrow{\nabla} \times \overrightarrow{H} = \vec{j} + \overrightarrow{X}$$

$$\overrightarrow{\nabla} \cdot \overrightarrow{\nabla} \times \overrightarrow{H} = \overrightarrow{\nabla} \cdot \vec{j} + \overrightarrow{\nabla} \cdot \overrightarrow{X}$$

$$0 = -\frac{\partial \rho}{\partial t} + \overrightarrow{\nabla} \cdot \overrightarrow{X}$$

Mas $\frac{\rho}{\epsilon_0} = \overrightarrow{\nabla} \cdot \overrightarrow{D}$

$$\overrightarrow{X} = \epsilon_0 \frac{\partial \overrightarrow{D}}{\partial t}$$

$$\overrightarrow{\nabla} \times \overrightarrow{H} = \vec{j} + \overrightarrow{X}$$

$$\overrightarrow{X} = \epsilon_0 \frac{\partial \overrightarrow{D}}{\partial t}$$

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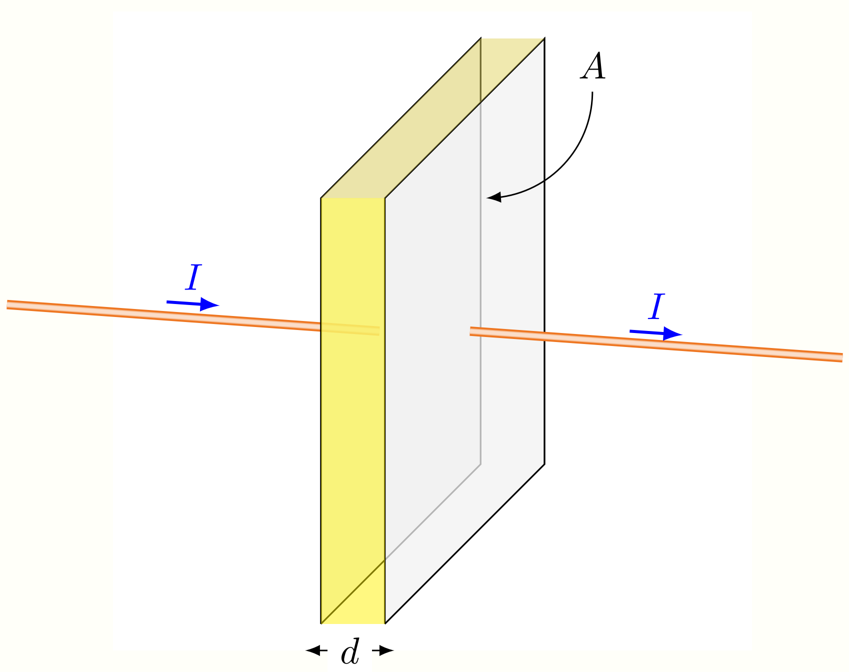
Equações de Maxwell
Corrente de deslocamento

$$\overrightarrow{\nabla} \times \overrightarrow{H} = \vec{j} + \epsilon_0 \frac{\partial \overrightarrow{D}}{\partial t}$$



Equações de Maxwell
Corrente de deslocamento

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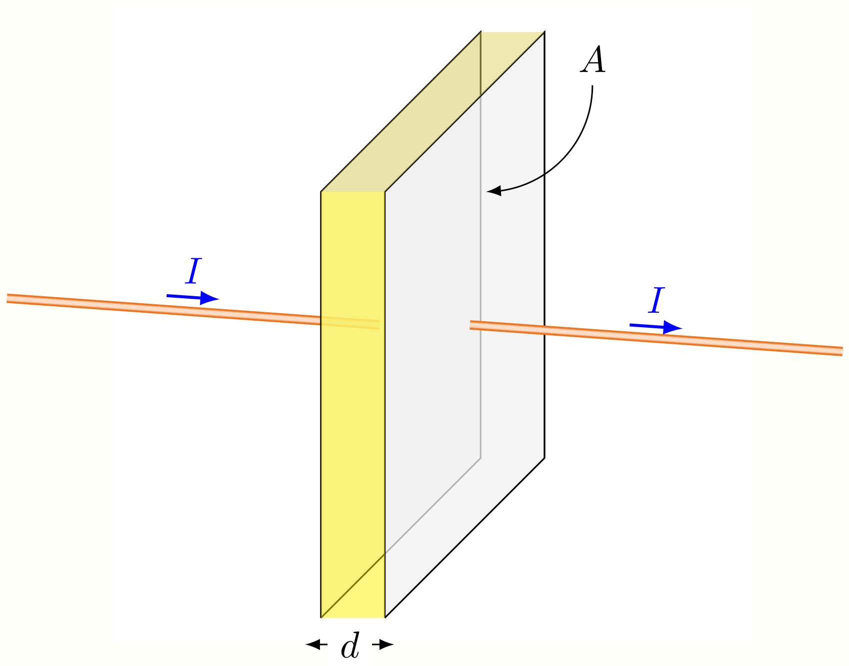
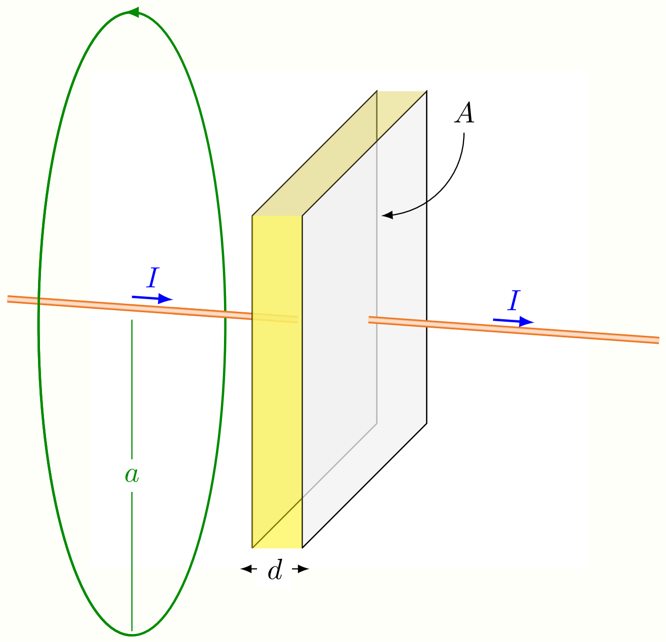


$$\vec{H} = ?$$

Equações de Maxwell
Corrente de deslocamento

$$\vec{\nabla} \times \vec{H} = \vec{j} + \epsilon_0 \frac{\partial \vec{D}}{\partial t}$$



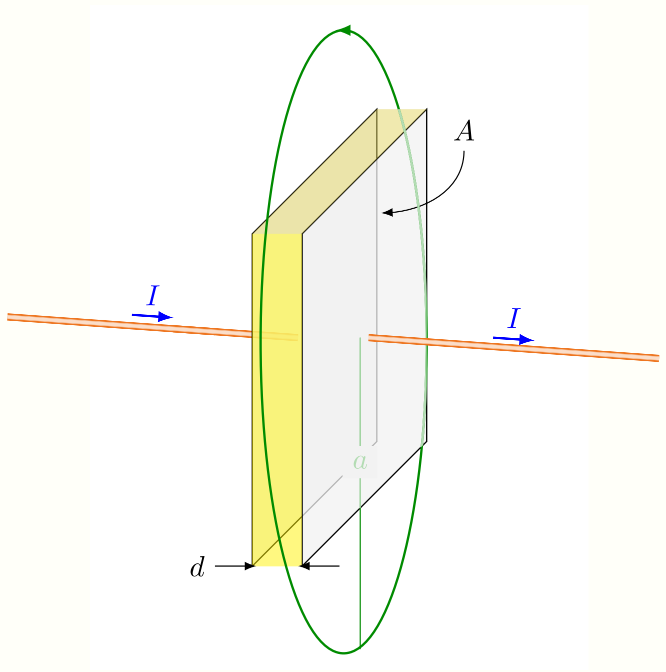
$$\vec{H} = ?$$

$$\int \vec{H} \cdot \mathrm{d}\vec{\ell} = I$$

$$\Rightarrow H = \frac{I}{2\pi a}$$

Equações de Maxwell
Corrente de deslocamento

$$\vec{\nabla} \times \vec{H} = \vec{j} + \epsilon_0 \frac{\partial \vec{D}}{\partial t}$$



$$\vec{H} = ?$$

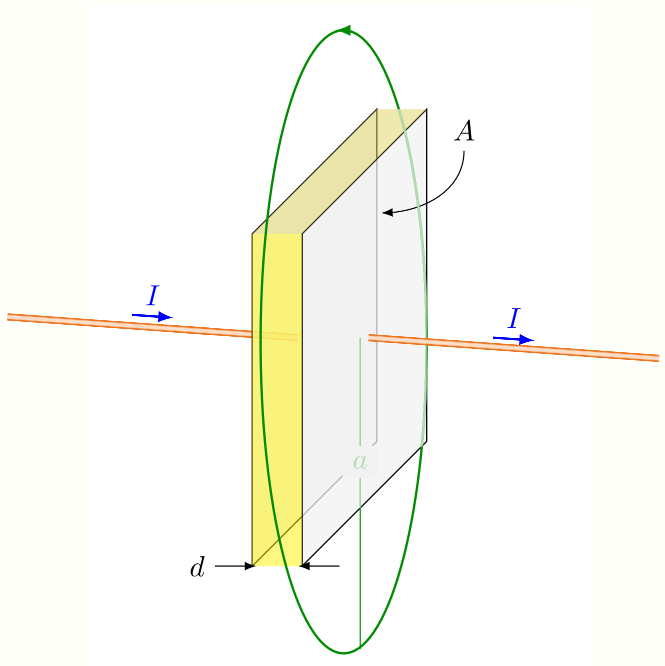
$$\int \vec{H} \cdot \mathrm{d}\vec{\ell} = A\epsilon_0 \frac{dD}{dt}$$

Equações de Maxwell
Corrente de deslocamento

$$\vec{\nabla} \times \vec{H} = \vec{j} + \epsilon_0 \frac{\partial \vec{D}}{\partial t}$$

$$\int \vec{H} \cdot \mathrm{d}\vec{\ell} = A\epsilon_0 \frac{dD}{dt}$$

$$D = \frac{1}{\epsilon_0}\frac{Q}{A}$$



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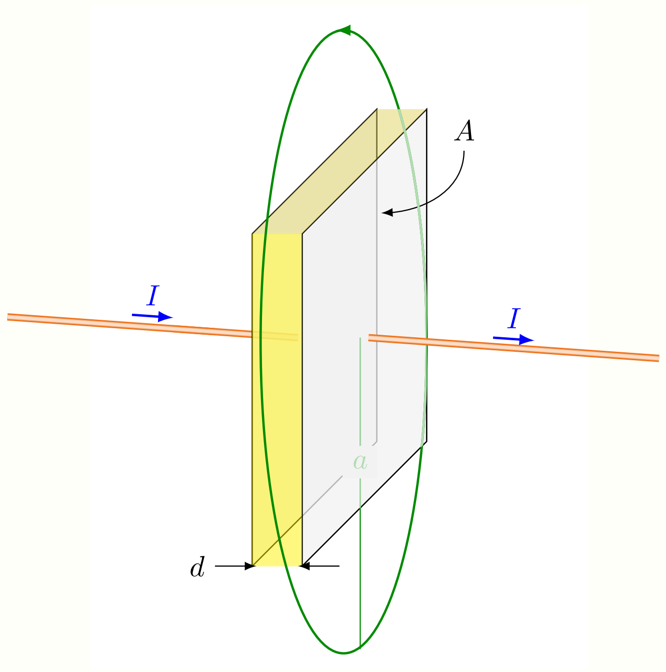


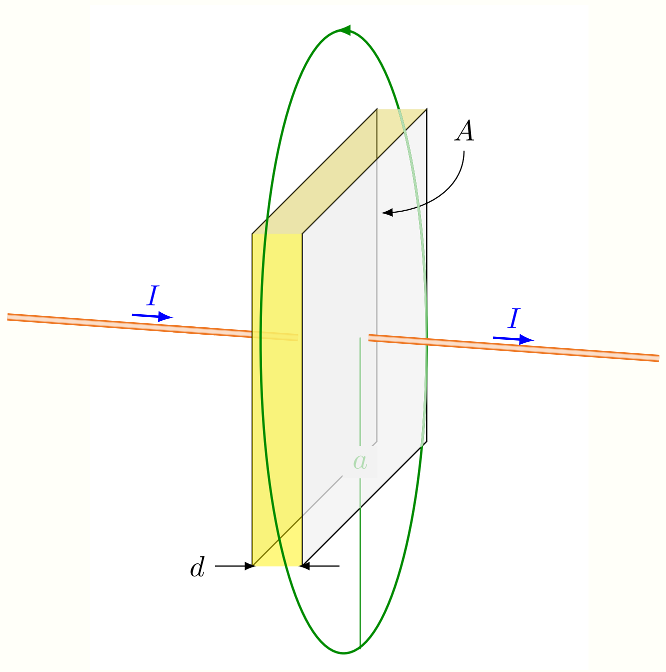
$$\int \overrightarrow{H} \cdot \mathrm{d}\overrightarrow{\ell} = A\epsilon_0 \left(\frac{1}{A\epsilon_0} \frac{dQ}{dt} \right)$$

Equações de Maxwell
Corrente de deslocamento

$$\vec{\nabla} \times \vec{H} = \vec{j} + \epsilon_0 \frac{\partial \vec{D}}{\partial t}$$

$$\int \vec{H} \cdot \mathrm{d}\vec{\ell} = \pi a^2 \epsilon_0 \frac{dD}{dt}$$

$$D = \frac{1}{\epsilon_0} \frac{Q}{A}$$



$$\int \vec{H} \cdot \mathrm{d}\vec{\ell} = A\epsilon_0 \left(\frac{1}{A\epsilon_0} \frac{dQ}{dt} \right)$$

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