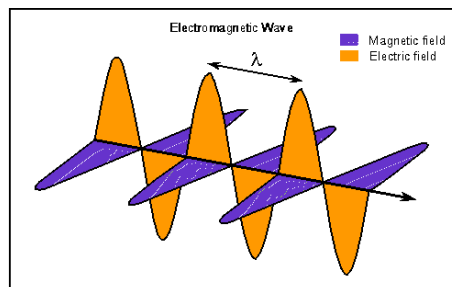
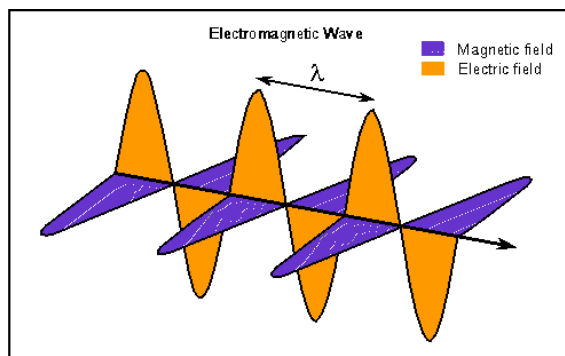


Radiação electromagnética



Onda electromagnética

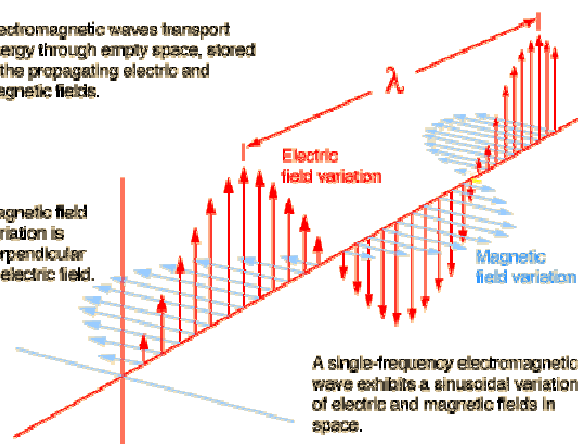


$$\vec{E} \perp \vec{B} \perp \vec{v}_{propagação}$$

Onda electromagnética

Electromagnetic waves transport energy through empty space, stored in the propagating electric and magnetic fields.

Magnetic field variation is perpendicular to electric field.

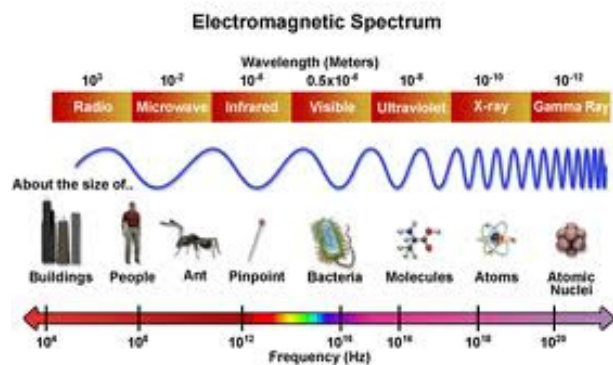


Espectro electromagnético

$$v = \frac{\lambda}{T} = \lambda f$$

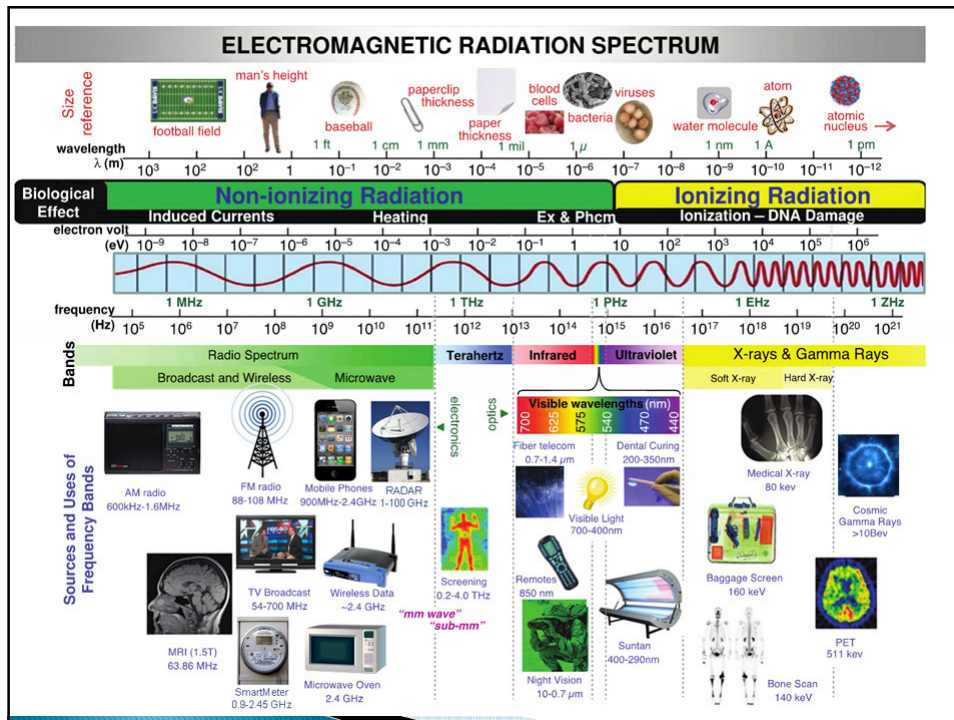
$$f = \frac{1}{T}$$

$$Energia = hf$$



Constante de Planck

$$h = 6,63 \times 10^{-34} \text{ J}$$



Onda electromagnética

Equação de onda do campo eléctrico

$$\frac{\partial^2 E}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 E}{\partial t^2}$$

Equação de onda do campo magnético

$$\frac{\partial^2 B}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 B}{\partial t^2}$$

$$c = 299792458 \text{ m/s}$$

Soluções das equações de onda:

$$E = E_0 \sin(kx - \omega t)$$

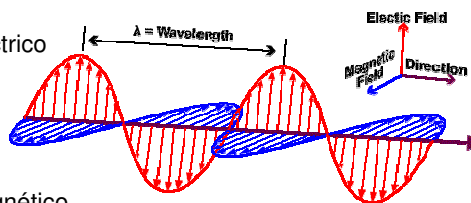
$$B = B_0 \sin(kx - \omega t)$$

$$k = \frac{2\pi}{\lambda}$$

$$\omega = 2\pi f$$

$$\frac{E_0}{B_0} = c$$

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$



Vector de Poynting

Vector de Poynting

Densidade de energia associada aos campos eléctrico e magnético

$$\begin{aligned}\vec{S} &\perp \vec{E} \perp \vec{B} \\ \bar{S} &= \frac{1}{\mu_0} \vec{E} \wedge \vec{B} \\ \bar{S} &= \frac{1}{\mu_0} \overline{EB} = \frac{1}{\mu_0} \overline{E_0 \sin(kx - \omega t) B_0 \sin(kx - \omega t)} \\ \bar{S} &= \frac{1}{\mu_0} E_0 \overline{[\sin(kx - \omega t)]^2} \frac{E_0}{c} \\ \bar{S} &= \frac{1}{\mu_0} \frac{E_0^2}{c} \overline{[\sin(kx - \omega t)]^2} \\ \bar{S} &= \frac{E_0^2}{2\mu_0 c}\end{aligned}$$