## Electromagnetic Waves

**Displacement Current** 

$$I_D = \varepsilon_0 \cdot \frac{d\phi_E}{dt}$$

The equation of plane progressive electromagnetic wave

$$E = E_0 \sin \omega \left( t - \frac{x}{c} \right)$$

$$B = B_0 \sin \omega \left( t - \frac{x}{c} \right) a$$

**Poynting Vector** 

The rate of flow of energy in an electromagnetic wave is described by the vector S called the poynting vector

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

The average electric energy density

$$U_E = \frac{1}{2}\varepsilon_0 E^2 = \frac{1}{4}\varepsilon_0 E_0^2$$

The average magnetic energy density

$$U_E = \frac{1}{2} \frac{B^2}{\mu_0} = \frac{1}{4} \frac{B_0^2}{\mu_0}$$

Radio waves Micro IR, UV X Rays Gamma Rays

Buildings Humans Butterflies Needle Point Protozoans Molecules Atoms Atomic Nuclei

Visible light