

## Electric and Magnetic Fields of a Wave

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See Unified Absolute Relativity Theory at:

[www.wbabin.net/saraiva/saraiva305.pdf](http://www.wbabin.net/saraiva/saraiva305.pdf)  
[www.wbabin.net/saraiva/saraiva306.pdf](http://www.wbabin.net/saraiva/saraiva306.pdf)  
[www.wbabin.net/saraiva/saraiva307.pdf](http://www.wbabin.net/saraiva/saraiva307.pdf)

Electric field:

$$E = \frac{\pi \cdot q_e}{\epsilon_0 x^2}$$

Magnetic field:

$$B = \frac{\pi \mu_0 q_e f^2}{c} = \frac{\pi \cdot q_e}{\epsilon_0 c x^2} \quad ; \quad E / B = c$$

$q_e$  - Electric charge;  $\epsilon_0$  - Vacuum permittivity;  $x$  - Wavelength;  
 $\mu_0$  - Vacuum permeability;  $f$  - Frequency;  $c$  - Light speed.

For a visible photon:

$$f = 5 \times 10^{14} \text{ Hz} \quad ; \quad x = 6 \times 10^{-7} \text{ m}$$

$$E = 1.58 \times 10^5 \text{ V / m..or..m}^2 / \text{s}^2 \quad ; \quad B = 5.27 \times 10^{-4} \text{ T..or..m / s}$$

In a wave the maximum magnetic field is in quadrature with the maximum electric field, not in phase.

Energy of the wave:

$$E_y = hf = 3.3 \times 10^{-19} \text{ J}$$

Energy of the magnetic field:

$$E_y = \frac{B^2}{\mu_0} x^3 2.2\pi = 3.3 \times 10^{-19} \text{ J}$$

Energy of the electric field:

$$E_y = \epsilon_0 E^2 x^3 2.2\pi = 3.3 \times 10^{-19} J$$

For  $B = c \Leftrightarrow x = 7.953 \times 10^{-13} m$

Force between a magnetic charge (Weber) and a magnetic field:

$$F = \frac{q_m B}{\mu_0} = q_e E$$

$$q_m = \frac{h}{2q_e} \Leftrightarrow \frac{2\mu_0 q_e^2 c}{h} = 4\alpha$$

$q_m$  - Magnetic charge;  $h$  - Planck constant;  $\alpha$  - Fine structure constant.

The magnetic field  $B$  is a speed.  
 The electric field is a squared speed.  
 Speeds of what?  
 Speeds of the vacuum particles.

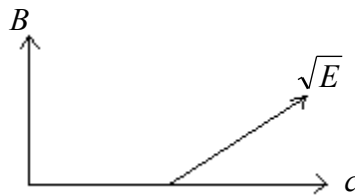
Energy of the charged one:

$$E_y = \frac{\epsilon_0^2}{\mu_0^2} = 310 MeV$$

$$x = 4 \times 10^{-15} m ; \quad m = 5.5235 \times 10^{-28} kg$$

Energy of the neutral one:

$$E_0 = 2\pi E_y \alpha^3 = 756.52 eV ; \quad m_0 = 1.3486 \times 10^{-33} kg$$



A particle is a rotating wave.  
 Condition for the existence of a particle:

$$\left\{ \begin{array}{l} F = \frac{mc^2}{R} = \frac{mc^2 2\pi}{x} \\ F = \frac{q_e q_m c}{\pi R^2} = \frac{hc 2\pi}{x^2} \end{array} \right. \Leftrightarrow mcx = h ; \quad (mwx = h)$$

$m$  - Mass;  $c$  - Light speed;  $x$  - Wavelength;  $h$  - Planck constant.