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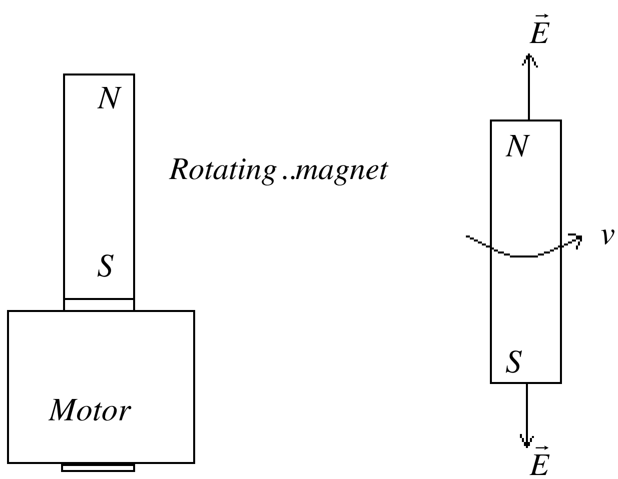
Electric Field of a Rotating Magnetic Charge

António Saraiva -- 2007-03-01
ajps2@hotmail.com

In 1821 Faraday and Ampere conducted several experiments with permanent magnets where they rotate around their own axis when in subjected to an electric current.

If we introduce into Maxwell's electromagnetic equations a magnetic charge, the phenomenon can be easily explained.



If two equal magnets support a mass of 1kg at a distance of 1mm, it corresponds to a force of 10 N:

$$F = \frac{1}{\mu_0}\frac{{Q_m}^2}{d^2}$$

The magnetic charge of each pole is equal to: $Q_m = 3.5\times10^{-6}$

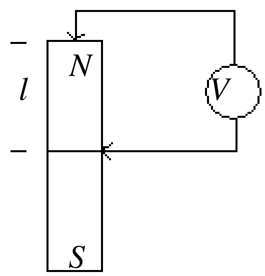
If the magnet has a diameter of 5 mm, a length of 7 cm and rotates at 1000 rot/min, the average linear speed is equal to $v = \omega R = 0.131 ms^{-1}$.

The electric field:

$$\vec{E} = \frac{Q_m v}{L^2} \qquad \text{and} \qquad L = 5\text{mm}$$

$$\vec{E} = 1.83\times 10^{-2}$$

We can directly measure the electric field or we can measure the electric potential on the magnet between its center and one pole:



Electric potential:

$$V_E = \vec{E}.l \quad \Leftrightarrow \quad V_E = 0.64mVolt$$

These forgotten experiments can prove the existence of the magnetic charge.