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Notes on Measurement of Electric Charge and Magnetic Flux

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Electric Charge:

Electric charge was defined, according to a previously introduced entropy-approach [1], as a form of energy or electromagnetic waves that have an electric potential, positive or negative. So; the unit of electric charge is a unit of Energy, i.e. in Joules. Hence; the current as a rate of flow of electric charge should be measured in Watt. Accordingly; the ammeter does not read such defined current but reads actually the rate of flow of electric energy per Volt. This can be shown from the following well known equation that is used in electric- power measurement or calculation [2]:

$$We = A * V \ldots \quad (1)$$

Where A can be defined as the ammeter reading and V is the potential difference.

Hence; the units of the Ammeter readings should be:

A= WV…. Watt Volt (2)

So; the universal system of units, that was previously introduced [3], may use the same ammeter as an instrument for measuring the current in Watt/Volt. The Ammeter does not measure actually the rate of flow of electric energy as previously assumed in Coulomb/sec but it measures the flow of electric entropy associated by the electric energy [3].

Magnetic Flux:

Magnetic Flux is defined also according to a published entropy approach and experimental work as a form of energy or electromagnetic waves that have magnetic potential, positive or negative [1]. So; the magnetic flux has to be measured in the same units of energy; i.e. in Joule. According to a scientific analogy between thermal, electric and magnetic energies and their common effect on an Al-Fe thermocouple [3]; it was found that their potentials could be measured also by the Volt. Revising the techniques of measurement of the magnetic flux; it is found that they depend on measuring the produced electric potential by the influence of the measured magnetic field on a conductor that carries an electric current [4]. So; the techniques used do not follow a direct approach but they depend on measuring electric-field parameters to find the corresponding magnetic parameters.

However; we can measure directly the magnetic energy that performs work in attracting iron balls along an inclined plane [1]. Hence; it is possible to recalibrate the already used Gauss-meter to measure the rate of flow of magnetic flux during such attraction process. According to the proved analogy between electric and magnetic fields and the common unit of their potentials as previously described; it is possible to assume the unit of measurement of the modified Gauss-meter to be identical to the unit of Ammeter readings; i.e. in Watt/volt. So; we may introduce the following equation to measure or calculate the magnetic power from readings of the Gauss-meter by an equation that is analogous to equation (1):

$$\mathrm{Wm} = \mathrm{G}^{*}\mathrm{H} \qquad (3)$$

Where G is the Gauss-meter reading and H is the magnetic potential in Volt. Hence; the unit of measurement in a modified Gauss-meter for measuring the rate of flow of magnetic flux per unit magnetic potential will be, according to equation (3), as follows:

$$\mathrm{G} = \mathrm{WV}\ldots\ \mathrm{Watt\ Volt} \qquad (4)$$

By analogy; this unit measures also the rate of flow of magnetic entropy associated by the magnetic energy [3].

References:

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[4] Gordon, D. Brown, R. Haben, J., “Methods for measuring the magnetic field,” Magnetics, IEEE Transactions, vol.8/1, pp. 48-51.