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Conversion of Gravitational Energy directly into Electrical Energy

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The electrical current arises in a conductor when an outside force acts upon the free electrons of the conductor. This force is called, in a generic way, of *electromotive force* (EMF). Usually, it is of *electrical* nature. Here, we show that it can have *gravitational* nature (*Gravitational Electromotive Force*). This fact led us to propose a system to convert Gravitational Energy into Electrical Energy, which can produce several tens of kilowatts of Electrical Energy.

Key words: Gravitational Electromotive Force, Gravitational Energy, Electrical Energy, Generation of Electrical Energy.

In a previous paper, we have proposed a system to convert *Gravitational Energy* directly into *Electrical Energy* [1]. This system uses Gravity Control Cells (GCCs). These GCC can be replaced by the recently discovered *Quantum Controllers of Gravity* (QCGs) [2], which can produce similar effect. In this paper, we propose a simplification for this system, without using GCCs or QCGs.

Under these conditions, the system shown in the previously mentioned paper reduces to a *coil with iron core*. Through the coil passes a electrical current i , with frequency f . Thus, there is a magnetic field through the iron core. If the system is subject to a gravity acceleration g (See Fig. 1), then

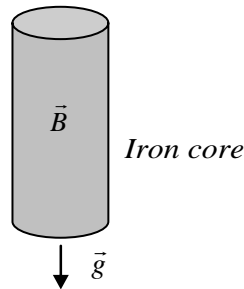


Fig. 1 – An iron core of a coil subjected to a gravity acceleration \vec{g} and magnetic field \vec{B} with frequency f .

the *gravitational forces* acting on *electrons* (F_e), *protons* (F_p) and *neutrons* (F_n) of the

Iron core, are respectively expressed by the following relations [3]

$$F_e = m_{ge} a_e = \chi_{Be} m_{e0} g \quad (1)$$

$$F_p = m_{gp} a_p = \chi_{Bp} m_{p0} g \quad (2)$$

$$F_n = m_{gn} a_n = \chi_{Bn} m_{n0} g \quad (3)$$

m_{ge} , m_{gp} and m_{gn} are respectively the *gravitational* masses of the electrons, protons and neutrons; m_{e0} , m_{p0} and m_{n0} are respectively the *inertial* masses at rest of the electrons, protons and neutrons. The expressions of the *correlations factors* χ_{Be} , χ_{Bp} and χ_{Bn} are deduced in the previously mentioned paper, and are given by

$$\chi_{Be} = \left\{ 1 - 2 \left[\sqrt{1 + \frac{45.56\pi^2 r_e^4 B_{rms}^4}{\mu_0^2 m_e^2 c^2 f^2}} - 1 \right] \right\} \quad (4)$$

$$\chi_{Bp} = \left\{ 1 - 2 \left[\sqrt{1 + \frac{45.56\pi^2 r_p^4 B_{rms}^4}{\mu_0^2 m_p^2 c^2 f^2}} - 1 \right] \right\} \quad (5)$$

$$\chi_{Bn} = \left\{ 1 - 2 \left[\sqrt{1 + \frac{45.56\pi^2 r_n^4 B_{rms}^4}{\mu_0^2 m_n^2 c^2 f^2}} - 1 \right] \right\} \quad (6)$$

The *Compton sized electron* predicts $r_e = 3.86 \times 10^{-13} m$ and standardized result recently obtained of $r_e = 4 - 7 \times 10^{-13} m$ [4]. The radius of *protons inside the atoms* (nuclei) is $r_p = 1.2 \times 10^{-15} m$, $r_n \cong r_p$. Then assuming $r_e \cong 5 \times 10^{-13} m$, we obtain from Eqs. (4) (5) and (6) the following expressions:

$$\chi_{Be} = \left\{ 1 - 2 \left[\sqrt{1 + 2.38 \times 10^8 \frac{B_{rms}^4}{f^2}} - 1 \right] \right\} \quad (7)$$

$$\chi_{Bn} \cong \chi_{Bp} = \left\{ 1 - 2 \left[\sqrt{1 + 2.35 \times 10^{-9} \frac{B_{rms}^4}{f^2}} - 1 \right] \right\} \quad (8)$$

where B_{rms} is the *rms* intensity of the magnetic field through the iron core and f is its oscillating frequency. Note that χ_{Bn} and χ_{Bp} are negligible in respect to χ_{Be} .

It is known that, in some materials, called *conductors*, the free electrons are so loosely held by the atom and so close to the neighboring atoms that they tend to drift randomly from one atom to its neighboring atoms. This means that the electrons move in all directions by the same amount. However, if some outside force acts upon the free electrons their movement becomes not random, and they move from atom to atom at the same direction of the applied force. This flow of electrons (their electric charge) through the conductor produces the *electrical current*, which is defined as a flow of electric charge through a medium [5]. This charge is typically carried by moving electrons in a conductor, but it can also be carried by ions in an electrolyte, or by both ions and electrons in a plasma [6].

Thus, the electrical current arises in a conductor when an outside force acts upon its free electrons. This force is called, in a generic way, of *electromotive force* (EMF). Usually, it is of *electrical* nature ($F_e = eE$). However, if the nature of the electromotive force is *gravitational* ($F_e = m_{ge}g$) then, as

the corresponding force of *electrical* nature is $F_e = eE$, we can write that

$$m_{ge}g = eE \quad (9)$$

According to Eq. (1) we can rewrite Eq. (9) as follows

$$\chi_{Be} m_{e0} g = eE \quad (10)$$

Now consider a *wire* with length l ; cross-section area S and electrical conductivity σ . When a voltage V is applied on its ends, the electrical current through the wire is i . Electrodynamics tell us that the electric field, E , through the wire is uniform, and correlated with V and l by means of the following expression [7]

$$V = \int \vec{E} d\vec{l} = El \quad (11)$$

Since the current i and the area S are constants, then the current density \vec{J} is also constant. Therefore, it follows that

$$i = \int \vec{J} \cdot d\vec{S} = \sigma ES = \sigma \left(\frac{V}{l} \right) S \quad (12)$$

By substitution of E , given by Eq.(11), into Eq.(10) yields

$$V = \chi_{Be} \left(\frac{m_{e0}}{e} \right) gl \quad (13)$$

By substitution of Eq. (13) into Eq. (12), we obtain

$$i = \chi_{Be} \left(\frac{m_{e0}}{e} \right) \sigma g S \quad (14)$$

These are, respectively, the voltage V between the ends of a wire and the current i through it, when the wire with conductivity σ and cross-section area S , is subjected to a gravity g (as shown in Fig.(2)) and a uniform magnetic field B with frequency f (The expression of χ_{Be} is given by Eq. (4)).

If $B_{H(rms)} = 0.7T$ * and $f_H = 1 \times 10^{-6} Hz$, then Eq. (16) gives

$$V \cong 0.84 l \quad (17)$$

In order to obtain $V = 220volts$, the total length l of the iron wire used in the *Toroidal coil* must have **262m**.

On the other hand, the intensity of the current through the *Toroidal coil* will be given by (Eq.14)

$$i = 0.84\sigma S \quad (18)$$

Since the electrical conductivity of the iron is $\sigma = 1.04 \times 10^7 S/m$, and assuming that the diameter of the iron wire is $\phi_{ironwire} = 4mm$, then we get

$$i \cong 110 \text{ Amperes} \quad (19)$$

Consequently, the power of the generator shown in Fig.3, is given by

$$P = Vi \cong 24.2kW \quad (20)$$

Note that, here the Helmholtz coil has *two turns only*, both separated by the distance R (See Fig.3 (a)). By using only 2 turns, both separated by a large distance, it is possible strongly to reduce the *capacitive effect* between the turns. This is highly relevant in this case because the extremely-low frequency $f = 1\mu Hz$ would strongly increase the capacitive reactance ($X_C = 1/2\pi fC$) associated to the inductor.

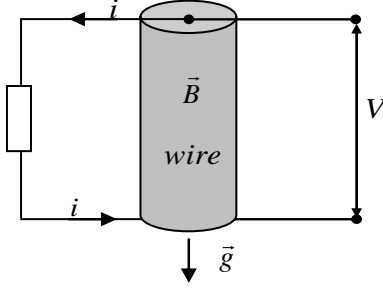


Fig. 2 – The voltage V between the ends of a wire and the current i through it, when it is subjected to a gravity g (as shown above), and a uniform magnetic field B with frequency f .

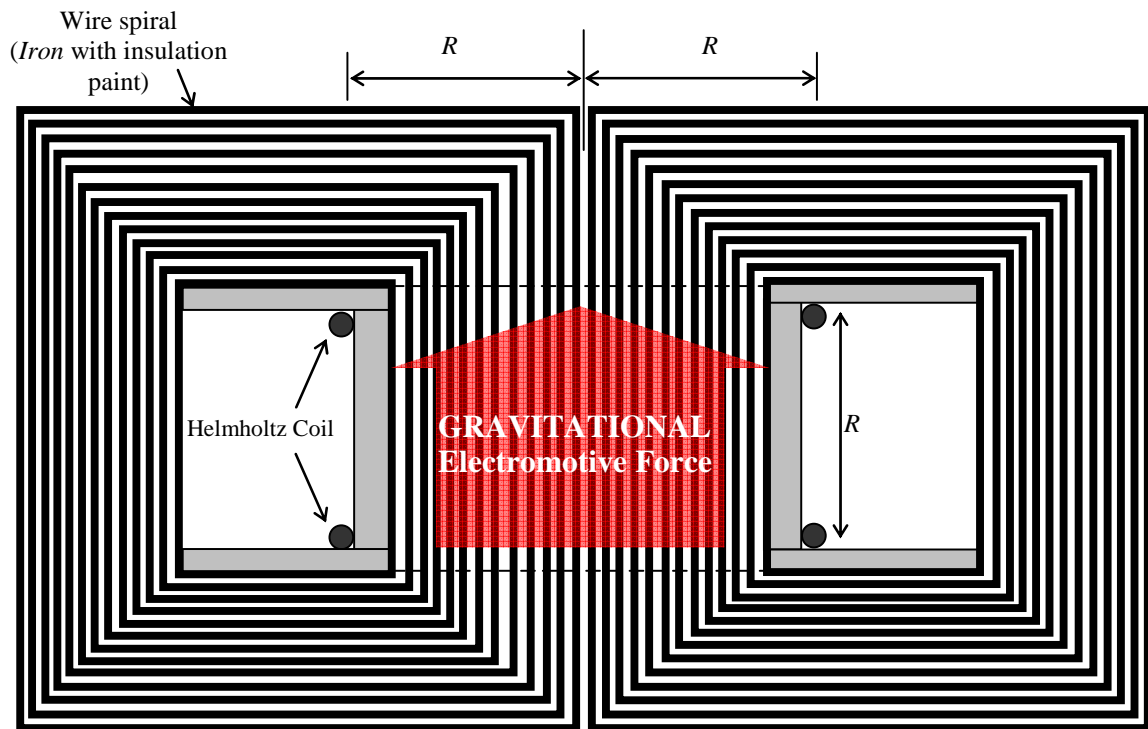
Now consider the system shown in Fig.3. It was designed to convert a large amount of gravitational energy into electrical energy. Basically, it consists in a Helmholtz coil placed into the core of a *Toroidal coil*. The current i_H through the *Helmholtz coil* has frequency f_H . The wire of the toroidal coil is made of *pure iron* ($\mu_r \cong 4000$) with *insulation paint*. Thus, the nucleus of the Helmholtz coil is filled with *iron wires*, which are subjected to a uniform magnetic field B_H with frequency f_H , produced by the Helmholtz coil. Then, according to Eq. (4), we have that

$$\chi_{Be} = \left\{ 1 - 2 \left[\sqrt{1 + 2.38 \times 10^8 \frac{B_{H(rms)}^4}{f_H^2}} - 1 \right] \right\} \quad (15)$$

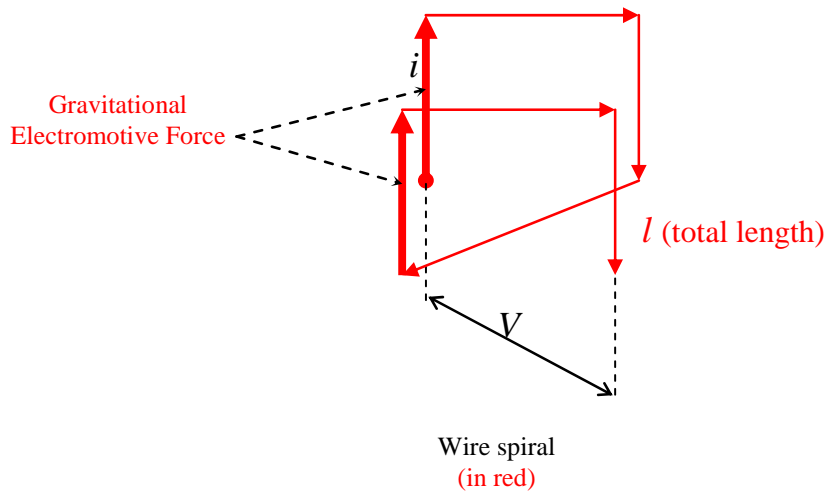
By substitution of Eq. (15) into Eq. (13), we obtain

$$V = \chi_{Be} \left(\frac{m_{e0}}{e} \right) gl = \left\{ 1 - 2 \left[\sqrt{1 + 2.38 \times 10^8 \frac{B_{H(rms)}^4}{f_H^2}} - 1 \right] \right\} \left(\frac{m_{e0}}{e} \right) gl \quad (16)$$

* The magnetic field at the midpoint between the coils is given by $B_H = \left(\frac{4}{5} \right)^{\frac{3}{2}} \frac{\mu_r \mu_0 Ni}{R}$. Here $\mu_r \cong 4000$ (pure iron).



(a)



(b)

Fig. 3 – Schematic Diagram of the System Designed to do the Conversion of Gravitational Energy directly into Electrical Energy

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