Quantum Controller of Gravity

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A new type of device for controlling gravity is here proposed. This is a quantum device because results from the behaviour of the matter and energy at subatomic length scale (10^{-20}m). From the technical point of view this device is easy to build, and can be used to develop several devices for controlling gravity.

Key words: Gravitation, Gravitational Mass, Inertial Mass, Gravity, Quantum Device.

Introduction

Some years ago I wrote a paper [1] where a correlation between gravitational mass and inertial mass was obtained. In the paper I pointed out that the relationship between gravitational mass, m_g, and *rest* inertial mass, m_{i0}, is given by

$$\chi = \frac{m_g}{m_{i0}} = \left\{1-2\left[\sqrt{1+\left(\frac{\Delta p}{m_{i0}c}\right)^2}-1\right]\right\} =$$

$$= \left\{1-2\left[\sqrt{1+\left(\frac{Un_r}{m_{i0}c^2}\right)^2}-1\right]\right\} =$$

$$= \left\{1-2\left[\sqrt{1+\left(\frac{Wn_r}{\rho c^2}\right)^2}-1\right]\right\} \qquad (1)$$

where Δp is the variation in the particle's *kinetic momentum*; U is *the electromagnetic energy absorbed or emitted by the particle;* n_r is the index of refraction of the particle; W is the density of energy on the particle (J/kg); ρ is the matter density (kg/m^3) and c is the speed of light.

Also it was shown that, if the *weight* of a particle in a side of a lamina is $\vec{P}=m_g\vec{g}$ ($\vec{g}$ perpendicular to the lamina) then the weight of the same particle, in the other side of the lamina is $\vec{P}' = \chi m_g \vec{g}$, where $\chi = m_g^l / m_{i0}^l$ (m_g^l and m_{i0}^l are respectively, the gravitational mass and the inertial mass *of the lamina*). Only when $\chi = 1$, the weight is equal in both sides of the lamina. The lamina works as a *Gravity Controller*. Since $P' = \chi P = (\chi m_g)g = m_g(\chi g)$, we can consider that

$$m_g' = \chi m_g \text{ or that } g' = \chi g$$

In the last years, based on these concepts, I have proposed some types of devices for controlling gravity. Here, I describe a device, which acts controlling the *electric field* in the Matter at *subatomic level* $(\Delta x \cong 10^{-20}m)$. This *Quantum Controller of Gravity* is easy to build and can be used in order to test the correlation between gravitational mass and inertial mass previously mentioned.

2. The Device

Consider a *spherical capacitor*, as shown in Fig.1. The *external* radius of the inner spherical shell is r_a, and the *internal* radius of the outer spherical shell is r_b. Between the inner shell and the outer shell there is a dielectric with electric permittivity $\varepsilon = \varepsilon_r\varepsilon_0$. The inner shell works as an *inductor*, in such way that, when it is charged with an electric charge $+q$, and the outer shell is connected to the ground, then the outer shell acquires a electric charge $-q$, which is uniformly distributed at the external surface of the outer shell, while the electric charge $+q$ is uniformly distributed at the external surface of the inner shell.

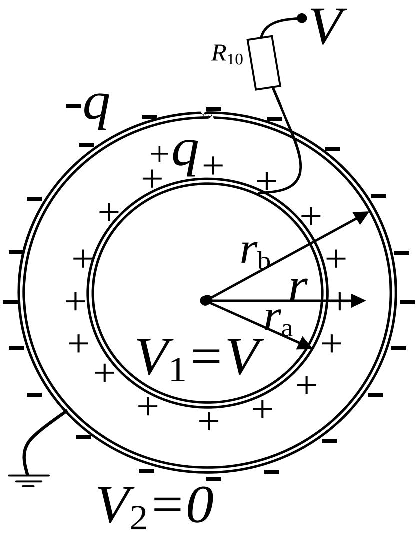

Fig.1 – *Spherical Capacitor* - A Device for Controlling Gravity developed starting from a Spherical Capacitor.

Under these conditions, the electric field between the shells is given by the vectorial sum of the electric fields $\vec{E}_a$ and $\vec{E}_b$, respectively produced by the inner shell and the outer shell. Since they have the same direction in this region, then one can easily show that the resultant intensity of the electric field for $r_a < r < r_b$ is $E_R = E_a + E_b = q/4\pi\varepsilon_r\varepsilon_0\, r^2$. In the nucleus of the capacitor and out of it, the *resultant electric field* is *null* because $\vec{E}_a$ and $\vec{E}_b$ have *opposite* directions (See Fig. 2(a)).

Note that the electrostatic force, $\vec{F}$, between $-q$ and $+q$ will move the *negative electric charges* in the direction of the positive electric charges. This causes a displacement, Δx, of the electric field, $\vec{E}_b$, *into the outer shell* (See Fig. 2 (b)). Thus, in the region with thickness Δx the intensity of the electric field *is not null* but equal to E_b.

The negative electric charges are accelerated with an acceleration, $\vec{a}$, in the direction of the positive charges, in such way that they acquire a velocity, given by $v = \sqrt{2a\Delta x}$ (drift velocity).

The drift velocity is given by [2]

$$v = \frac{i}{nSe} = \frac{V/Z}{nSe} = \frac{V/\sqrt{R^2 + X_C^2}}{nSe} \qquad (2)$$

where V is the *positive* potential applied on the inner shell (See Fig. 1); $X_C = 1/2\pi fC$ is the capacitive reactance; f is the frequency; $C = 4\pi\varepsilon\left(r_a r_b / r_b - r_a\right)$ is the capacitance of the spherical capacitor; R is the total electrical resistance of the external shell, given by $R = \left(\Delta z/\sigma S\right) + R_{10}$, where $\Delta z/\sigma S$ is the electrical resistance of the shell ($\Delta z = 5mm$ is its thickness; σ is its conductivity and S is its surface area), and R_{10} is a 10gigaohms resistor. Since $R_{10} >> \Delta z/\sigma S$, we can write that $R \cong R_{10} = 1\times 10^{10}\,\Omega$.

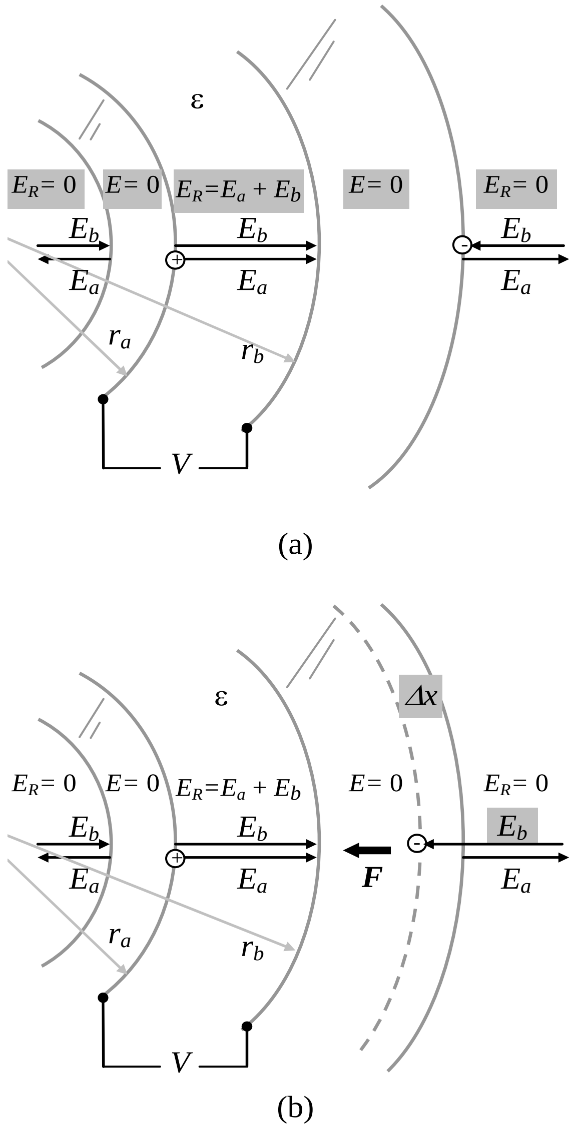

Fig.2 - The displacement, Δx, of the electric field, $\vec{E}_b$, *into the outer shell*. Thus, in the region with thickness Δx the intensity of the electric field *is not null* but equal to E_b.

If the shells are made with *Aluminum*, with the following characteristics: $\rho = 2700 kg.m^{-3}$, $A = 27 kg/kmol, n = N_0 \rho / A \cong 6\times10^{28} m^{-3}$ (N_0 is the Avogadro's number $N_0 = 6.02\times10^{26} kmol^{-1}$), and $r_a = 0.1m; r_b = 0.105m; S = 4\pi(r_b + \Delta z)^2 \cong 0.152m^2$; $r_b - r_a = 5\times10^{-3}m$, then $R >> X_C = (6.8\times10^{8}/f)ohms$, ($f > 1Hz$), and Eq. (2) can be rewritten in the following form:

$$v = \frac{i}{nSe} \cong \frac{V/R_{10}}{nSe} = 6.8\times10^{-20} V \qquad (3)$$

The *maximum size of an electron* has been estimated by several authors [3, 4, 5]. The conclusion is that the electron must have a physical radius smaller than 10^{-22} m*.

Assuming that, under the action of the force $\vec{F}$ (produced by a pulsed voltage waveform, V), the electrons would fluctuate about their initial positions with the *amplitude* of $\Delta x \cong 1\times10^{-20} m$(See Fig.3), then we get

$$\Delta t = \sqrt{\frac{2\Delta x}{a}} = \frac{2\Delta x}{v} \cong \frac{0.294}{V} \qquad (4)$$

However, we have that $f = 1/\Delta T = 1/2\Delta t$. Thus, we get

$$f = 1.7V \qquad (5)$$

Now consider Eq. (1). The *instantaneous values* of the density of electromagnetic energy in an *electromagnetic* field can be deduced from Maxwell's equations and has the following expression

$$W = \tfrac{1}{2}\varepsilon E^2 + \tfrac{1}{2}\mu H^2 \qquad (6)$$

where $E = E_m \sin \omega t$ and $H = H \sin \omega t$ are the *instantaneous values* of the electric field and the magnetic field respectively.

It is known that $B = \mu H$, $E/B = \omega/k_r$ [6] and

$$v = \frac{dz}{dt} = \frac{\omega}{\kappa_r} = \frac{c}{\sqrt{\frac{\varepsilon_r \mu_r}{2}\left(\sqrt{1+(\sigma/\omega\varepsilon)^2}+1\right)}} \qquad (7)$$

where k_r is the real part of the *propagation vector* $\vec{k}$ (also called *phase constant*); $k = |\vec{k}| = k_r + ik_i$; ε, μ and σ, are the electromagnetic characteristics of the medium in which the incident (or emitted) radiation is propagating ($\varepsilon = \varepsilon_r \varepsilon_0$; $\varepsilon_0 = 8.854\times10^{-12} F/m$; $\mu = \mu_r \mu_0$ where $\mu_0 = 4\pi\times10^{-7} H/m$). It is known that for *free-space* $\sigma = 0$ and $\varepsilon_r = \mu_r = 1$. Then Eq. (7) gives

$$v = c$$

From Eq. (7), we see that the *index of refraction* $n_r = c/v$ is given by

$$n_r = \frac{c}{v} = \sqrt{\frac{\varepsilon_r \mu_r}{2}\left(\sqrt{1+(\sigma/\omega\varepsilon)^2}+1\right)} \qquad (8)$$

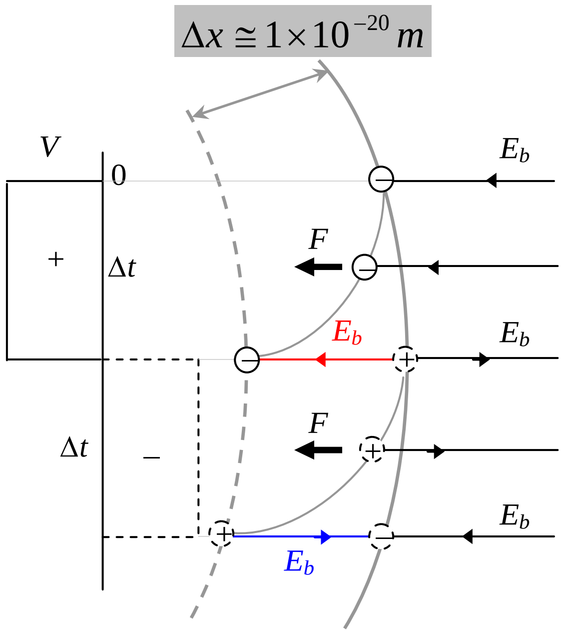

Fig.3 - Controlling the Electric Field in the Matter at *subatomic level* $(\Delta x \cong 10^{-20} m)$.

Equation (7) shows that $\omega/\kappa_r = v$. Thus, $E/B = \omega/k_r = v$, i.e.,

* Inside of the matter.

$$E = vB = v\mu H$$

Then, Eq. (6) can be rewritten in the following form:

$$W = \tfrac{1}{2}\left(\varepsilon v^2 \mu\right)\mu H^2 + \tfrac{1}{2}\mu H^2 \qquad (9)$$

For $\sigma << \omega\varepsilon$, Eq. (7) reduces to

$$v = \frac{c}{\sqrt{\varepsilon_r \mu_r}}$$

Then, Eq. (9) gives

$$W = \tfrac{1}{2}\left[\varepsilon\left(\frac{c^2}{\varepsilon_r \mu_r}\right)\mu\right]\mu H^2 + \tfrac{1}{2}\mu H^2 = \mu H^2$$

This equation can be rewritten in the following forms:

$$W = \frac{B^2}{\mu} \qquad (10)$$

or

$$W = \varepsilon\ E^2 \qquad (11)$$

For $\sigma >> \omega\varepsilon$, Eq. (7) gives

$$v = \sqrt{\frac{2\omega}{\mu\sigma}} \qquad (12)$$

Then, from Eq. (9) we get

$$W = \tfrac{1}{2}\left[\varepsilon\left(\frac{2\omega}{\mu\sigma}\right)\mu\right]\mu H^2 + \tfrac{1}{2}\mu H^2 = \left(\frac{\omega\varepsilon}{\sigma}\right)\mu H^2 + \tfrac{1}{2}\mu H^2 \cong$$

$$\cong \tfrac{1}{2}\mu H^2 \qquad (13)$$

Since $E = vB = v\mu H$, we can rewrite (13) in the following forms:

$$W \cong \frac{B^2}{2\mu} \qquad (14)$$

or

$$W \cong \left(\frac{\sigma}{4\omega}\right)E^2 \qquad (15)$$

Substitution of Eq. (15) into Eq. (2), gives

$$m_g = \left\{1 - 2\left[\sqrt{1 + \frac{\mu}{4c^2}\left(\frac{\sigma}{4\pi f}\right)^3 \frac{E^4}{\rho^2}} - 1\right]\right\} m_{i0} =$$

$$= \left\{1 - 2\left[\sqrt{1 + \left(\frac{\mu_0}{256\pi^3 c^2}\right)\left(\frac{\mu_r \sigma^3}{\rho^2 f^3}\right)E^4} - 1\right]\right\} m_{i0} =$$

$$= \left\{1 - 2\left[\sqrt{1 + 1.758\times10^{-27}\left(\frac{\mu_r \sigma^3}{\rho^2 f^3}\right)E^4} - 1\right]\right\} m_{i0} \qquad (16)$$

Using this equation we can then calculate the gravitational mass, $m_{g(\Delta x)}$, of the region with thickness Δx, in the outer shell. We have already seen that the electric field in this region is $\vec{E}_b$, whose intensity is given by $E_b = q/4\pi\varepsilon\left(r_b + \Delta z\right)^2$. Thus, we can write that

$$E_b \cong \frac{q}{4\pi\varepsilon r_b^2} = \frac{CV}{4\pi\varepsilon r_b^2} \qquad (17)$$

where $C = 4\pi\varepsilon\left(r_a r_b / r_b - r_a\right)$ is the capacitance of the spherical capacitor; V is the potential applied on the inner shell (See Fig. 1 and 3). Thus, Eq. (17) can be rewritten as follows

$$E_b = \frac{r_a V}{r_b\left(r_a - r_b\right)} \cong 1.9\times10^2 V \qquad (18)$$

Substitution of $\rho = 2700 kg.m^{-3}$, $\sigma = 3.5\times10^7 S/m$, $\mu_r \cong 1$ (Aluminum) and $E = E_b \cong 1.9\times10^2 V$ into Eq. (16) yields

$$m_{g(\Delta x)} = \left\{1 - 2\left[\sqrt{1 + \frac{1.3\times10^{-2}\ V^4}{f^3}} - 1\right]\right\} m_{i0(\Delta x)} \qquad (19)$$

Equation (5) shows that there is a correlation between V and f to be obeyed, i.e., $f = 1.7V$. By substituting this expression into Eq. (19), we get

$$\chi = \frac{m_{g(\Delta x)}}{m_{i0(\Delta x)}} = \left\{1 - 2\left[\sqrt{1 + 2.64\times10^{-3} V} - 1\right]\right\} \qquad (20)$$

For $V = 35.29\ Volts\ \left(f = 1.7V = 60Hz\right)$[†], Eq. (20) gives

$$\chi = \frac{m_{g(\Delta x)}}{m_{i0(\Delta x)}} \cong 0.91 \qquad (21)$$

For $V = 450\ Volts\ \left(f = 1.7V = 765Hz\right)$, Eq. (20) gives

$$\chi = \frac{m_{g(\Delta x)}}{m_{i0(\Delta x)}} \cong 0.04 \qquad (22)$$

For $V = 1200\ Volts\ \left(f = 1.7V = 2040Hz\right)$, Eq. (20) gives

$$\chi = \frac{m_{g(\Delta x)}}{m_{i0(\Delta x)}} \cong -1.1 \qquad (23)$$

In this last case, the weight of the shell with thickness Δx will be $\vec{P}_{\Delta x} \cong -1.1 m_{i0(\Delta x)} \vec{g}$; the sign (-) shows that it becomes *repulsive* in respect to Earth's gravity. Besides this it is also *intensified* 1.1 times in respect to its initial value.

It was shown that, if the *weight* of a particle in a side of a lamina is $\vec{P} = m_g \vec{g}$ ($\vec{g}$ perpendicular to the lamina) then the weight of the same particle, in the other side of the lamina is $\vec{P}' = \chi m_g \vec{g}$, where $\chi = m_g^l / m_{i0}^l$ (m_g^l and m_{i0}^l are respectively, the gravitational mass and the inertial mass *of the lamina*) [1]. Only when $\chi = 1$, the weight is equal in both sides of the lamina. The lamina works as a *Gravity Controller*. Since $P' = \chi P = \left(\chi m_g\right) g = m_g \left(\chi g\right)$, we can consider that

$$m_g' = \chi m_g \text{ or that } g' = \chi g$$

Now consider the Spherical Capacitor previously mentioned. If the gravity below the capacitor is g, then *above the first* hemispherical shell with thickness Δx (See Fig.4) it will become χg, and above the second hemispherical shell with thickness Δx, the gravity will be $\chi^2 g$.

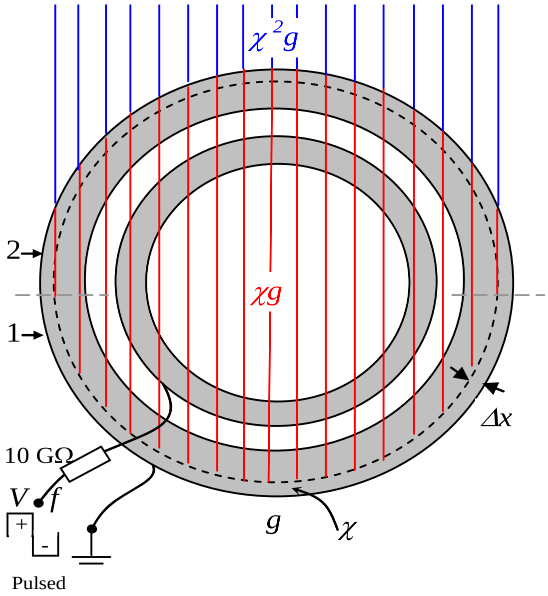

Fig.4 – The shell with thickness Δx works as a *Quantum Controller of Gravity*.

Since the voltage V is correlated to the frequency f by means of the expression $f = 1.7V$ (Eq. (5)), then it is necessary to put a *synchronizer* before the pulse generator (See Fig.5), in order to synchronize V with f. Thus, when we increase the voltage, the frequency is simultaneously increased at the same proportion, according to Eq. (5).

[†] Note that the frequency f must be greater than 1Hz (See text above Eq. (3)).

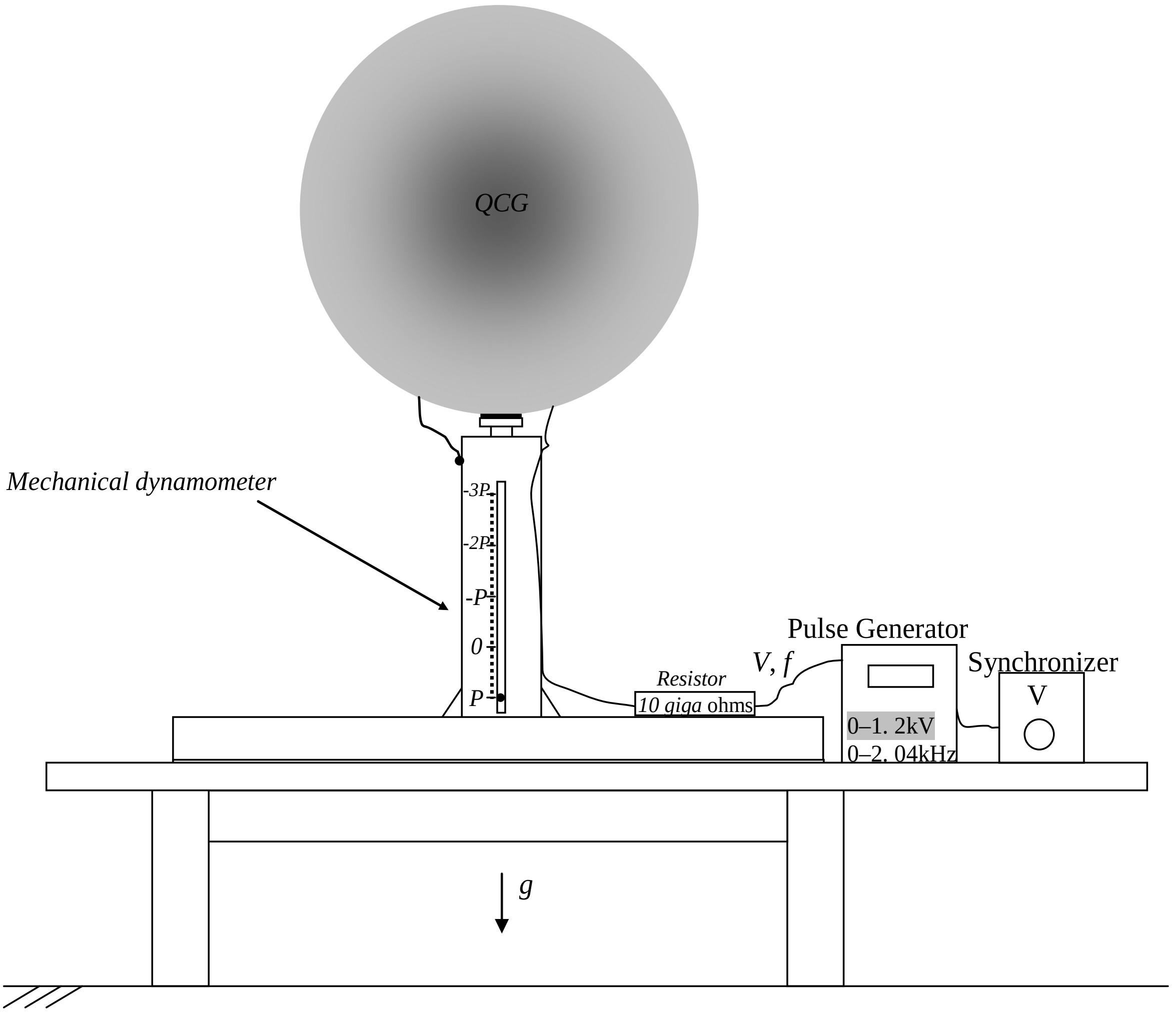

Fig.4 – Experimental Set-up using a Quantum Controller of Gravity (QCG).

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