Local Control of Gravity using a Parallel Plate Capacitor, subjected to Extra Low Frequency voltages

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Here, we show an experiment in order to measure the gravity acceleration above of one side of the dielectric of a Parallel Plate Capacitor when the opposite side of the dielectric is facing to Earth surface, and the capacitor is subjected to a sinusoidal voltage with Extremely Low Frequency (ELF). The results here obtained shows that, in these circumstances, the gravity acceleration above of the dielectric is strongly modified.
Key words: Gravitational Interaction, Gravity, Gravitational Mass.

1. Introduction

Several years ago I have published a fundamental paper [1] where a correlation between gravitational mass, m_g, and rest inertial mass, m_{i0}, was obtained. The correlation is expressed 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 $\left(kg/m^3\right)$ and c is the speed of light.

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

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

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 $B = \mu H$, $E/B = \omega/k_r$ [2] and

$$v = \frac{dz}{dt} = \frac{\omega}{\kappa_r} = \frac{c}{\sqrt{\frac{\varepsilon_r\mu_r}{2}\left(\sqrt{1+(\sigma/\omega\varepsilon)^2}+1\right)}} \qquad (3)$$

where k_r is the real part of the *propagation vector* $\vec{k}$ (also called *phase constant*); $k = \left|\vec{k}\right| = k_r + ik_i$; 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 $\mu_0 = 4\pi\times10^{-7}H/m$). From Eq. (3), we see that the *index of refraction* $n_r = c/v$ is given by

$$n_r = \frac{c}{v} = \sqrt{\frac{\varepsilon_r\mu_r}{2}\left(\sqrt{1+(\sigma/\omega\varepsilon)^2}+1\right)} \qquad (4)$$

Equation (3) shows that $\omega/\kappa_r = v$. Thus, $E/B = \omega/k_r = v$, i.e.,

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

Then, Eq. (2) can be rewritten as follows

$$W = \tfrac{1}{2}\varepsilon E^2 + \tfrac{1}{2}\mu\left(\frac{E}{v\mu}\right)^2 =$$
$$= \tfrac{1}{2}\varepsilon E^2 + \tfrac{1}{2}\left(\frac{1}{v^2\mu}\right)E^2 =$$
$$= \tfrac{1}{2}\left(\frac{1}{v^2\mu}\right)E^2 + \tfrac{1}{2}\left(\frac{1}{v^2\mu}\right)E^2 =$$
$$= \left(\frac{1}{v^2\mu}\right)E^2 = \left(\frac{c^2}{v^2\mu c^2}\right)E^2 =$$
$$= \left(\frac{n_r^2}{\mu c^2}\right)E^2 \qquad (5)$$

For $\sigma >> \omega\varepsilon$, Eq. (3) gives

$$n_r^2 = \frac{c^2}{v^2} = \frac{\mu\sigma}{2\omega}c^2 \qquad (6)$$

Substitution of Eq. (6) into Eq. (5) gives

$$W = (\sigma/2\omega)E^2 \qquad (7)$$

Substitution of Eq. (7) into Eq. (1), yields

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

$$= \left\{1 - 2\left[\sqrt{1 + \left(\frac{\mu_0}{64\pi^3 c^2}\right)\left(\frac{\mu_r \sigma^3}{\rho^2 f^3}\right)E^4} - 1\right]\right\} m_{i0} =$$

$$= \left\{1 - 2\left[\sqrt{1 + 7.032\times10^{-27}\left(\frac{\mu_r \sigma^3}{\rho^2 f^3}\right)E^4} - 1\right]\right\} m_{i0} \qquad (8)$$

Note that if $E = E_m \sin \omega t$ .Then, the average value for E^2 is equal to $\frac{1}{2}E_m^2$ because E varies sinusoidaly (E_m is the maximum value for E). On the other hand, we have $E_{rms} = E_m/\sqrt{2}$. Consequently, we can change E^4 by E_{rms}^4 , and the Eq. (8) can be rewritten as follows

$$m_g = \left\{1 - 2\left[\sqrt{1 + 7.032\times10^{-27}\left(\frac{\mu_r \sigma^3}{\rho^2 f^3}\right)E_{rms}^4} - 1\right]\right\} m_{i0} \qquad (9)$$

The *Ohm's vectorial Law* tells us that $j_{rms} = \sigma E_{rms}$. Thus, we can write Eq. (9) in the following form:

$$m_g = \left\{1 - 2\left[\sqrt{1 + 7.032\times10^{-27}\frac{\mu_r j_{rms}^4}{\sigma\rho^2 f^3}} - 1\right]\right\} m_{i0} \qquad (10)$$

where $j_{rms} = j/\sqrt{2}$ [2].

Since

$$j = \frac{i}{S} = \frac{V/R}{S} = \frac{V}{RS} = \frac{V}{(l/\sigma S)S} = \sigma\left(\frac{V}{l}\right) \qquad (11)$$

Then, we can write that

$$j_{rms} = \frac{\sigma}{\sqrt{2}}\left(\frac{V}{l}\right) \qquad (12)$$

By substitution of Eq. (12) into Eq.(10), we get

$$\chi = \frac{m_g}{m_{i0}} = \left\{1 - 2\left[\sqrt{1 + 1.758\times10^{-27}\left(\frac{\mu_r \sigma^3}{\rho^2}\right)\frac{(V/l)^4}{f^3}} - 1\right]\right\} \qquad (13)$$

Also, I shown in the previously mentioned paper [1] that, when a *lamina* of any material, is place inside a gravitational field, with the gravity acceleration of the field, $\vec{g}$, *perpendicular* to the lamina, as shown in Fig. 1, then, if the *weight* of a particle in a side of a lamina is $\vec{P} = m_g \vec{g}$, then the weight of the same particle, when it is placed in the other side of the lamina (See Fig.1) 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 rest inertial mass *of the lamina*). This means that, if the gravity acceleration at one of the sides of the lamina is $\vec{g}$, then the gravity in the other side of the lamina becomes χg .

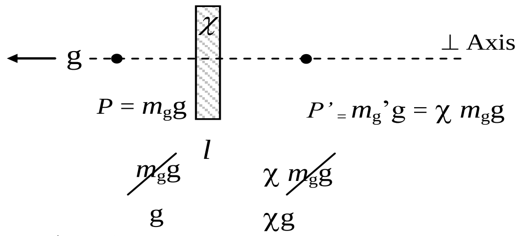


Figure 1 - If the gravity acceleration at one of the sides of the lamina is $\vec{g}$, then the gravity in the other side of the lamina becomes χg .

Thus, only when $\chi = 1$, the gravity is the same at both sides of the lamina.

This shows that, by controlling the value of χ , of the lamina, *it is possible to produce the local control of gravity.*

In practice, we can produce this effect, using a *parallel plate capacitor*, as showed in Fig.2.

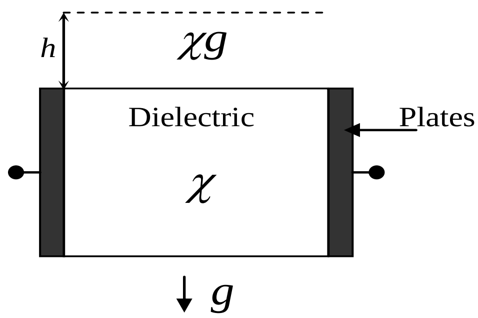
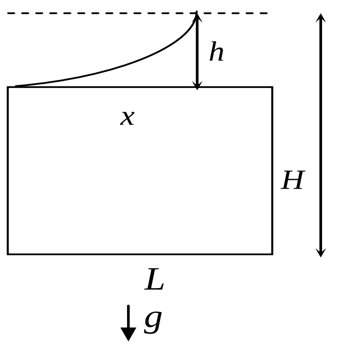


Figure 2 - Parallel Plate Capacitor with its *dielectric* positioned, perpendicularly to the gravity, $\vec{g}$. By controlling the value of χ , of the dielectric, it is possible modify the gravity above the dielectric, along a height h .

Note that we can use the *exponential*

distribution formula†, $f(x;y) = ye^{-yx}$, $(x \geq 0)$, in order to calculate the value of h, $h = f(x;y)$. See Fig. 2a below



$$h = ye^{-yx}$$

Fig. 2a - For $x = 0 \rightarrow y = H$. For $x = L \rightarrow y = H + h$. Then, taking the *exponential distribution formula*, with $x = L$ and $y = H + h$ we get

$$h = (H + h)e^{-(H+h)L}.$$

If the dielectric is $H_2 0$ (bi-distilled water, $\mu_r = 1$ $\varepsilon_r = 80$; $\sigma = 2\times10^{-4}\,S/m >> \omega\varepsilon \cong 4.5\times10^{-9} f$; $\rho = 1000 kg.m^{-3}$; *dieletric strength* $> 20KV/mm$), then, by applying a sinusoidal voltage V with frequency, f, in the plates of the capacitor, we obtain, according to Eq. 13, that

$$\chi = m_g/m_{i0} = \left\{1 - 2\left[\sqrt{1 + 1.40\times10^{-44}\left(E_{rms}^4/f^3\right)} - 1\right]\right\} \qquad (14)$$

The Electric Field of the *dipole of the H₂0 Molecule* is given by [3]:

$$\vec{E} = \left[3(\vec{p}.\hat{r})\hat{r} - \vec{p}\right]/4\pi\varepsilon_0 r^3 = 2\vec{p}/4\pi\varepsilon_0 r^3 \qquad (15)$$

where $p = 6.17\times10^{-30} C.m$ and $r = 9.6\times10^{-11} m$. Thus, we get $E = 1.25\times10^{11} V/m$. The exact calculation of the electric field inside a water molecule is very complex; it depends on of several factors. Here, we will assume the value $\bar{E} \cong E$ for the entire molecule.

Now consider that an *external oscillating electric field*, $E_f \cong 10V/m$, with frequency f is applied on the water molecule. The vectorial sum of $\bar{E}$ with E_f produces an oscillating field, $\vec{E}_{rms}$, with intensity $E_{rms} \cong \bar{E} \cong 1.25\times10^{11} V/m$. By substituting this value into Eq. (14), we get

$$\chi = m_g/m_{i0} \cong \left\{1 - 2\left[\sqrt{1 + 3.42/f^3} - 1\right]\right\} \quad (16)$$

Figure 3 shows an experimental set-up, that we have built, in order to measure the gravity acceleration above the dielectric (*bi-distilled water*) of a Parallel Plate Capacitor, when it is subjected to a sinusoidal voltage with Extremely Low Frequency (ELF).

2. Results

The *experimental* results, obtained from the device shown in Fig. 3, are placed in the Table.1, and they can be compared with the correspondent theoretical results (obtained starting from Eq. (16) also placed in the mentioned Table. 1.

f (Hz)	F (kgf) *	Experimental $\chi = F/F_0$	Theoretical χ $(Eq.16)$
0.5	-7.7(5)	-7.7(5)	-7.65
0.7	-3.6(5)	- 3.6(5)	-3.62
0.9	-1.8(0)	-1.8(0)	- 1.77
1.1	-0.7(5)	-0.7(5)	- 0.77
1.3	-0.2(0)	-0.2(0)	- 0.19

*Weighing Scale (the sign – is because the force F has direction contrary to Earth gravity $\vec{g}$)

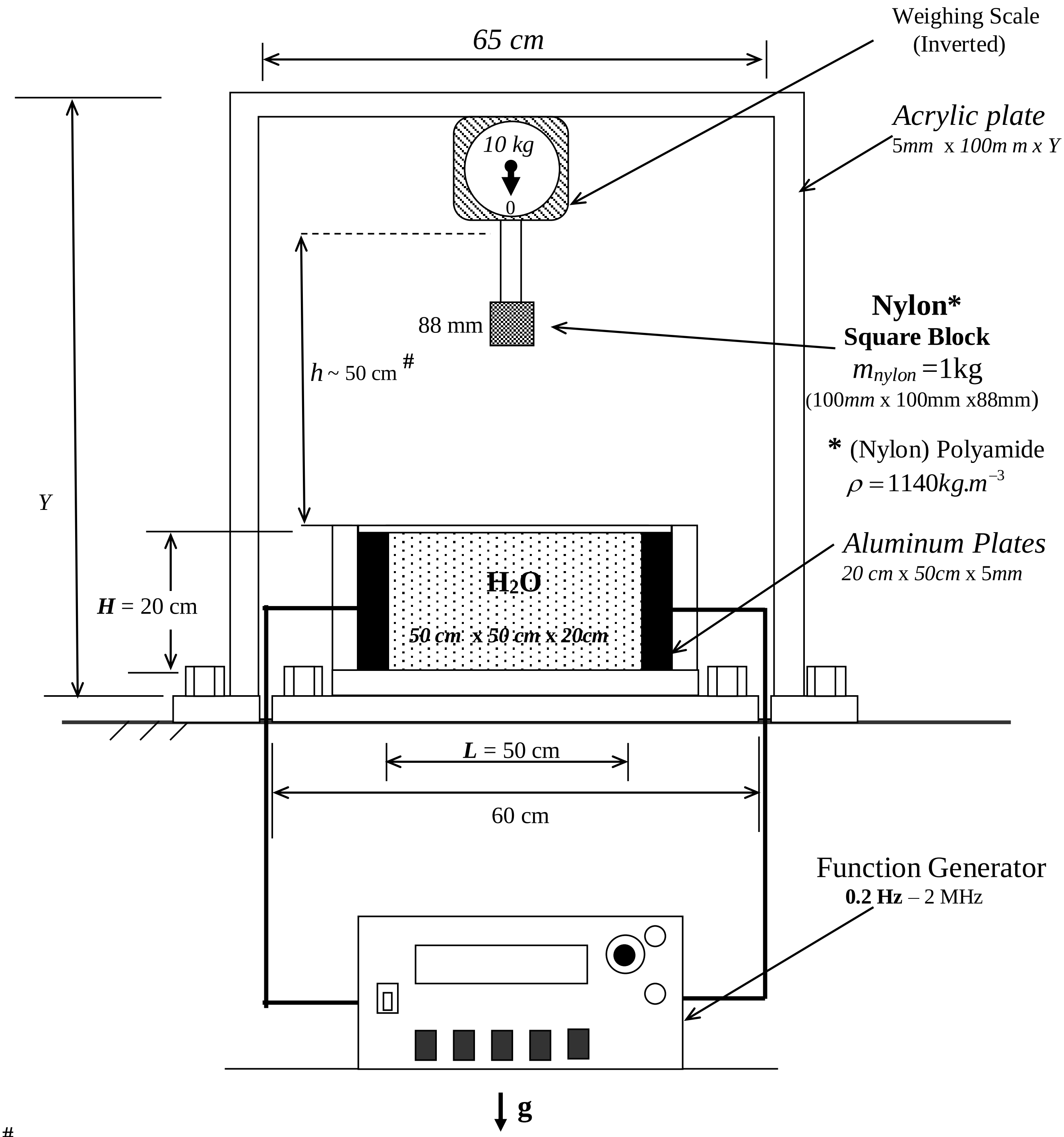
$m_{nylon} = 1kg$ (See Fig.3) => $F_0 = 1kgf$ $(9.8N)$

Table 1 – Experimental and Theoretical values for χ .

3. Conclusion

An experimental arrangement to check these results is very simple to be building, and practically it can be made in any laboratory that it has a Function Generator, in order to produce extremely-low frequency voltages (ELF). This means that the results here obtained can be easily verified.

† The *probability density function* (PDF) of an exponential distribution.



Experimental result (h~50cm) in agreement with the *theoretical* result obtained by means the equation: $h = (H + h)e^{-(H+h)L}$ (See Fig. 2a), for $H = 0.20m$ and $L = 0.5m$.

Figure 3 – Schematic diagram of the Experimental Set-up created to check the Gravity above the Dielectric (H_20) of a Parallel Plate Capacitor when it is subjected to a Sinusoidal Voltage with Extremely Low Frequency (ELF).

$$\chi = m_g / m_{i0} \cong \left\{ 1 - 2\left[\sqrt{1 + 3.42 / f^3} - 1 \right] \right\} \quad (16)$$

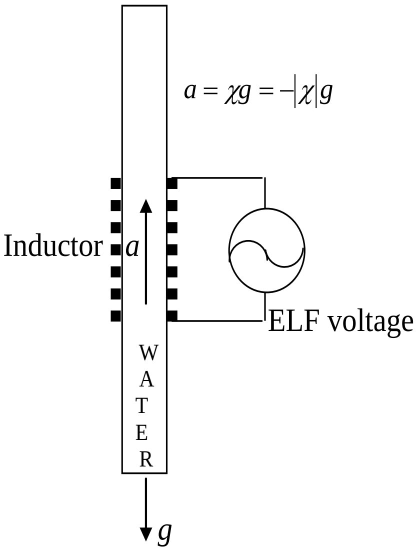


Fig. 4 – Gravity Water Pump

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