A Possibility of Gravity Control in Luminescent Materials

Fran De Aquino

Maranhao State University, Physics Department, 65058-970 S.Luis/MA, Brazil. E-mail: deaquino@elo.com.br

Abstract

It was demonstrated (gr-qc/9910036) that the gravitational and inertial masses are correlated by an adimensional factor, which depends on the incident (or emitted) radiation upon the particle. There is a direct correlation between the radiation absorbed (or radiated) by the particle and its gravitational mass, independently of the inertial mass. Only in the absence of electromagnetic radiation the mentioned factor becomes equal to one. On the other hand, in specific electromagnetic conditions, it can be reduced, nullified or made negative. This means that there is the possibility of the gravitational masses can be reduced, nullified or made negative by means of electromagnetic radiation. This unexpected theoretical result was confirmed by an experiment using Extra-Low Frequency (ELF) radiation on ferromagnetic material (gr-qc/0005107). Recently another experiment using UV light on phosphorescent plastic have confirmed the phenomenon. We present a complete explanation for the alterations of the gravitational field in luminescent materials. This work indicates that the alterations of the gravitational field can be sufficiently strong to invert the gravity on luminescent materials.

Introduction

It is known that the physical property of mass has two distinct aspects, gravitational mass \( m_g \) and inertial mass \( m_i \). Gravitational mass produces and responds to gravitational fields. It supplies the mass factors in Newton’s famous inverse-square law of gravity\( F_{12} = G m_1 m_2 / r_{12}^2 \). Inertial mass is the mass factor in Newton’s 2nd Law of Motion (\( F = m a \)).

In a previous paper\(^1\) we have shown that the gravitational mass and the inertial mass are correlated by an adimensional factor, which depends on the incident radiation upon the particle. It was shown that only in the absence of electromagnetic radiation this factor becomes equal to 1 and that, in specific electromagnetic conditions, it can be reduced, nullified or made negative.

The general expression of correlation between gravitational mass \( m_g \) and inertial mass \( m_i \), is given by

\[
m_g = m_i - 2 \left\{ \left( 1 + \frac{q}{m_i c} \right)^2 - 1 \right\} m_i
\]

where the momentum \( q \), according to the Quantum Mechanics, is given by

\[
q = \hbar k = \hbar \omega / (\omega / k) = U (dz/dt) = U / v
\]
where \( U \) is the electromagnetic energy absorbed (or emitted) by the particle; \( v \) is the velocity of the incident (or emitted) radiation. It can be shown that

\[
v = \frac{c}{\sqrt{\frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{\varepsilon \omega c} \right)^2} + 1 \right)}} \tag{3}
\]

where \( \varepsilon \), \( \mu \) and \( \sigma \) are the electromagnetic characteristics of the outside medium around the particle in which the incident radiation is propagating \( (\varepsilon = \varepsilon \varepsilon_0 \text{ where } \varepsilon_0 \text{ is the relative electric permittivity and } \varepsilon_0 = 8.854 \times 10^{-12} \text{ F/m} ; \mu = \mu \mu_0 \text{ where } \mu_0 \text{ is the relative magnetic permeability and } \mu_0 = 4\pi \times 10^{-7} \text{ H/m} ) \). For an atom inside a body, the incident (or emitted) radiation on this atom will be propagating inside the body, and consequently \(, \sigma = \sigma_{\text{body}}, \varepsilon = \varepsilon_{\text{body}}, \mu = \mu_{\text{body}} \).

By substitution of Eqs.(2) and (3) into Eq.(1), we obtain

\[
m_s = m_i - 2 \left\{ \left[ \frac{U}{mc^2} \right] \frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{\varepsilon \omega c} \right)^2} + 1 \right) - 1 \right\} m_i
\]

\[
m_s = m_i - 2 \left\{ \left[ \frac{U}{mc^2} \right] \frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{\varepsilon \omega c} \right)^2} + 1 \right) - 1 \right\} m_i \tag{4}
\]

In the equation above \( n_r \) is the refractive index, which is given by:

\[
n_r = \frac{c}{v} = \sqrt{\frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{\varepsilon \omega c} \right)^2} + 1 \right)} \tag{5}
\]

\( c \) is the speed in vacuum and \( v \) is the speed in medium.

If the incident (or emitted) radiation is monochromatic and has frequency \( f \), we can put \( U = n hf \) in Equation (4), where \( n \) is the number of incident (or radiated) photons on the particle of mass \( m_i \). Thus we obtain

\[
m_s = m_i - 2 \left\{ \left[ \frac{n hf}{m_i \omega c^2} \right] \frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{n hf c^2} \right)^2} + 1 \right) - 1 \right\} m_i \tag{6}
\]

In that case, according to the Statistical Mechanics, the calculation of \( n \) can be made based on the well-known method of Distribution Probability. If all the particles inside the body have the same mass \( m_i \), the result is

\[
n = \frac{N}{A} \tag{7}
\]

where \( N/A \) is the average density of incident (or emitted) photons on the body; \( A \) is the area of the surface of a particle of mass \( m_i \) from the body.

Obviously the power \( P \) of the incident radiation must be \( P = N hf/(\Delta t) = N hf^2 \), thus we can write \( N = P / hf^2 \). Substitution of \( N \) into Eq.(7) gives

\[
n = \frac{a}{hf^2} \left( \frac{P}{A} \right) = \frac{a}{hf^2} \frac{P}{A} \tag{8}
\]

where \( D \) is the power density of the incident (or emitted) radiation. Thus Eq.(6) can be rewritten in the following form:

\[
m_s = m_i - 2 \left\{ \left[ \frac{aD}{m_i \omega c f} \right] \frac{\varepsilon \mu}{2} \left( \sqrt{1 + \left( \frac{\sigma}{aD \omega c f} \right)^2} + 1 \right) - 1 \right\} m_i \tag{9}
\]

For \( \sigma >> \omega c \) Eq.(3) reduces to

\[
v = \frac{4\pi f}{\sqrt{\mu \sigma}} \tag{10}
\]

By substitution of Eq.(10) into Eq.(9) we obtain
\[ m_g = m_i - 2 \left\{ 1 + \left( \frac{aD}{mc \sqrt{4\pi^3}} \right)^2 \right\} - 1 m_i \] (11)

This equation shows clearly that, atoms (or molecules) can have their gravitational masses strongly reduced by means of Extra-Low Frequency (ELF) radiation.

We have built a system (called System G) to verify the effects of the ELF radiation on the gravitational mass of a body. In the system G, a 60Hz frequency radiation was produced by an ELF antenna. A thin layer of annealed pure iron around the antenna (toroid form) have absorbed all the ELF radiation.

In this annealed iron toroid \( \mu_r = 25000 \) (\( \mu = 25000\mu_0 \)) and \( \sigma = 1.03 \times 10^7 S/m \). The power density \( D \) of the incident ELF radiation reach approximately 10Kw/m². By substitution of these values into Eq.(11) it is easy to conclude the obtained results.

The experimental setup and the obtained results were presented in a paper².

The experiment above mentioned have confirmed that the general expression of correlation between gravitational mass and inertial mass (Eq.4) is correct. In practice, this means that the gravitational forces can be reduced, nullified and inverted by means of electromagnetic radiation.

Recently another experiment using UV light on phosphorescent materials have confirmed the phenomenon³.

In this paper we present a complete explanation for the alterations of the gravitational field in luminescent (photo, electro, thermo and tribo) materials. It was shown that the alterations of the gravitational field can be sufficiently strong to invert the gravity on luminescent materials.

1. Theory

When the material is luminescent, the radiated photons number \( n \), radiated from the electrons, cannot be calculated by the Eq.(7), because, according to the quantum statistical mechanics, they are undistinguishable photons of varying frequencies and consequently follow the Einstein-Bose statistics. In that case, as we know, the number \( n \) (\( n \) is the number of photons with frequency between \( f \) and \( f + \Delta f \)) will be given by

\[ n = \left( \frac{8\pi V f^2}{v^3} \right) \frac{1}{e^{E/m \cdot c^2} - 1} \int_{f}^{f+\Delta f} df \equiv \left( \frac{8\pi V}{v^3} \right) \frac{1}{e^{E/m \cdot c^2} - 1} f^2 \Delta f \]

Thus, assuming \( \Delta f \equiv 1Hz \) (quasi-mono chromatic) we obtain

\[ n \equiv \left( \frac{8\pi V f^2}{v^3} \right) \frac{1}{e^{E/m \cdot c^2} - 1} \equiv \left( \frac{8\pi V}{v^3} \right) \frac{1}{e^{\lambda/c} - 1} \equiv \left( \frac{8\pi V}{v^2} \right) \frac{1}{e^{\lambda/c} - 1} \]

(12)

where \( \lambda = h/m \cdot c \) is the Compton wavelength for the particle of mass \( m_i \) and \( \lambda \) is the average wavelength of the light emitted from the particle; \( V \) is the volume of the body which contains the particle.

By substitution of Eq.(12) into Eq.(6) we obtain

\[ m_g = m_i - 2 \left\{ 1 + \left( \frac{8\pi V}{v^2} \right) \frac{\lambda}{c} - 1 \right\} m_i \] (13)

For \( \sigma \ll \omega e \) the Eq.(3) reduces to

\[ v = \frac{c}{\sqrt{\epsilon, \mu,}} \quad \text{and} \quad \lambda = \frac{c}{f \sqrt{\epsilon, \mu,}} \]

Consequently Eq.(13) can be rewritten in the following form
\[ m_g = m_i - 2\left\{1+\left\{\frac{8\pi V}{c^3}\right\}^{2}n_i^2 \frac{\lambda / \lambda_i}{\epsilon^1 / \epsilon_i - 1}\right\}m_i \] (14)

For electrons \( m_i = m_v = 9.11\times10^{-31} \text{kg} \) and \( \lambda_{v(\text{electrons})} = 2.42\times10^{-12} \text{m} \). For atoms \( \lambda_{v(\text{atoms})} \ll \lambda_{v(\text{electrons})} \). On the other hand, if \( \lambda >> \lambda_v \Rightarrow \frac{\lambda_v / \lambda}{\epsilon_{\lambda_v} / \lambda - 1} \approx 1 \)

Then Eq.(14) reduces to

\[ m_g = m_i - 2\left\{1+\left\{\frac{8\pi V}{c^3}\right\}^{2}n_i^2 \right\} - 1\right\}m_i \] (15)

In the Hardeman experiment \(^3\)

\[ \left(\frac{8\pi V}{c^3}\right) f^2 n_i^3 \approx 0.658 \]

Consequently, from Eq.(15) we obtain for the electrons of the luminescent material:

\[ m_{v(\text{electrons})} \approx 0.605 m_{v(\text{electrons})} \]

This means a 39.5% reduction in gravitational masses of the electrons of the atoms of the phosphorescent material. Thus, the total reduction in gravitational mass of the phosphorescent material will be given by

\[ m_e - 0.605 m_e \times 100 \% = -0.011 \% \]

Exactly the value obtained in the Hardeman experiment.

Now we will calculate the power of UV radiation, necessary to produce the reduction of weight, detected by Hardeman in the phosphorescent material.

According to the Quantum Statistical Mechanics the gas of photons inside a luminescent material has a average number of photons \( N \), where

\[ N = \frac{1}{e^{E / kT} - 1} \] (16)

This means that the UV power \( P \) should have the following value

\[ P = N hf^2 = \frac{h c^2}{\lambda^2 (e^{\lambda / \lambda} - 1)} \] (17)

For \( \lambda = 365 \text{ nm} \) (UV light). The equation above gives

\[ P \approx 68 \text{ W} \]

From the Electrodynamics we know that a radiation with frequency \( f \) propagating within a material with electromagnetic characteristics \( \epsilon, \mu \) and \( \sigma \) has the amplitudes of its waves decreased of \( e^{-1}=0.37 \) (37%) when it penetrates a distance \( z \), given by

\[ z = \frac{1}{\omega \sqrt{1 - \epsilon / \epsilon^2 \frac{\sigma}{\omega \epsilon}}} \] (18)

The radiation is totally absorbed if it penetrates a distance \( \delta \approx 5z \).

Thus, if we put under UV radiation \( \lambda=365\text{nm} \), > 68w) a sheet of phosphorescent plastic with \( \sigma<<1 \text{S/m} \) and \( \epsilon > \epsilon_0 \); \( \mu > \mu_0 \), the Eq. above tell us that \( z > > 5\text{mm} \). Consequently, we can assume that the UV radiation at 365nm has a good penetration within the plastic sheet above (thickness = 2mm).

On the other hand, if we assume that the sheet has an index of refraction \( n_r \sim 1 \), thus, according to Eq.(15), for \( f \sim 6\times10^{14} \text{Hz} \) (green light radiated from the sheet), the gravitational mass of the electrons of the sheet will be NEGATIVE and given by
Thus, the total reduction in gravitational mass of the sheet of phosphorescent material will be given by

\[ m_s = m_r - 2 \sqrt{\frac{8\pi V}{c^3} f^2 n_i^2} - 1 \]

\[ \equiv -335.1 m_r \]  \hspace{1cm} (19)

2. The Gravitational Motor

For \( \sigma \gg \omega \epsilon \), as we have seen, Eq.(3) reduces to Eq.(10), i.e.,

\[ \nu = \frac{\sqrt{\frac{4 \pi f}{\mu \sigma}}} \]

Consequently Eq.(13), for \( \lambda \gg \lambda_i \), can be rewritten in the following form,

\[ m_s = m_r - 2 \left[ \sqrt{1 + \left( \frac{8\pi V}{c^3} f^2 n_i^2 \right)} - 1 \right] m_i \]  \hspace{1cm} (20)

The difference between Eq.(20) and Eq.(15) is in exponent of the index of refraction \( n_i \).

Both Eq.(15) and Eq.(20) tell us that luminescent materials with high refractive indices can be very efficient in gravity control technology.

In the particular case of the Gravitational Motor (presented in a previous paper) these materials can simplify its construction.

Let us consider figure 1 where we present a new design for the Gravitational Motor based on electroluminescent materials.

The average mechanical power \( P \) of the motor is

\[ P = T \omega = (F R) \omega = (m_s g) R \left( \frac{g}{r} \right)^3 = \]

\[ = m_r \sqrt{g^2 r} \]  \hspace{1cm} (21)

where \( r = R - (R_0 + \Delta r) \), (see Fig.1-a) and \( m_r \) is the gravitational mass of the electroluminescent material inside the left-half of the rotor (when NEGATIVE, obviously) (see rotor in Fig.1). It is easy to show that \( m_s \) may be written in the form

\[ m_s = \left[ \frac{N(Km_r)}{N(m_r + m_p + m_n)} \right] m_i \]  \hspace{1cm} (22)

for \( Km_r > m_r + m_p + m_n; K > 3666.3 \)

where \( m_p = m_n = 1.67 \times 10^{-27} \text{ kg} \) are the masses of the proton and neutron respectively and \( K \), in agreement with Eq.(20), is given by

\[ K = 2 \left[ \frac{8\pi V f^2}{c^3} n_i^2 \right] \]  \hspace{1cm} (23)

By substitution of Eq.(23) into Eq.(22) we obtain

\[ m_s = \left[ \frac{8\pi V f^2}{c^3} n_i^2 \right] \frac{m_i}{m_r + m_p + m_n} \]  \hspace{1cm} (24)

But the electroluminescent (EL) material of the rotor is divided in disks to reduce the gravitational pressure on them (see Fig.1-b). These disks (organic luminescent material) are between electrodes and submitted to suitable alternating voltage \( \Delta V \) to emit blue light (frequency \( f = 6.5 \times 10^{14} \text{ Hz} \)).

Thus, according to Eq.(24), the gravitational mass \( m_s \) of one EL disk, (with volume \( V = \pi R_0^2 \xi \) where
$R_0, \xi$ are respectively, the radius and the thickness of the EL disk), is given by

$$m_g^t = \left[\frac{16\pi R_0^2 \xi^2}{c^3} f^2 \right] \frac{m_v}{m_v + m_p + m_r} \rho \quad (25)$$

$$K = 2 \left[ \frac{8\pi Vf^2}{c^3 - n_i^2} \right] = \frac{16\pi (\pi R_0^2 \xi)}{c^3} n_i$$

For example, if the rotor has $R = 627\,mm; L = 1350\,mm$ and the EL disks:

$R_0 = 190\,mm; \rho \equiv 800\,kg/m^3; \xi = 45\,mm; \chi = 0.2\,mm \ and \ n_r \equiv 1$ then the gravitational mass of each EL disk (ON) is

$$m_g^t = -4.4\,kg \quad K \equiv 4014$$

If the left-half of the rotor has

$N_l = 2 \frac{L - \chi}{\xi + \chi} = 60$ EL disks(ON), then

the total gravitational mass $m_g$ is

$$m_g = N_l m_g^t = 264\,kg$$

Thus, according to Eq.(21) the power of the motor is

$$P = (264)\sqrt{(9.8)^3 (0.627 - (0.190 + 0.002)} \equiv$$

$$\equiv 5.3\,Kw \equiv 7\,HP$$

A electric generator coupled at this motor can produce for one month an amount of electric energy $W$ given by

$$W = P \Delta t = (5300\,w)(2.59 \times 10^6 \,s) =$$

$$\equiv 1.4 \times 10^{10} \,j \equiv 3800\,Kwh$$

It is important to note that if $n_r \equiv 2$ the power of the motor increases to approximately 112 HP!

3. Conclusion

We have studied the possibility to control the gravity on luminescent materials and have concluded that electroluminescent materials with high refractive indices are a new and efficient solution for the gravity control technology. Particularly in the case of the gravitational motors.

References

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2. De Aquino, F. (2000) “Possibility of Control of the Gravitational Mass by Means of Extra-Low Frequencies Radiation”, Los Alamos National Laboratory preprint no.gr-qc/0005107.

3. Hardeman, C. (2001) “The Aquino/Hardeman Photo-gravity effect”, in http://www.icnet.net/users/chrish/Photo-gravity.htm

4. De Aquino, F. (2000) “How to Extract Energy Directly from a Gravitational Field”, Los Alamos National Laboratory preprint no.gr-qc/0007069.
Fig. 1 – The Gravitational Motor

(a) Cross-section of the Motor
- Rotor
- Eletroluminescent disk (ON) (organic luminescent disk)
- Eletroluminescent disk (OFF)
- Motor Axis
- Film electrodes (thickness = $\chi = 0.2$ mm)
- Organic luminescent disk (thickness = $\xi = 45$ mm)

(b) Schematic diagram of the battery of (EL) cells
- L
- AC

R
R$_0$
$\Delta r$
$\Gamma$
APPENDIX A

It is important to note that the momentum \( q \) in Eq.(1) can be also produced by an Electric and/or Magnetic field if the particle has an electric charge \( Q \).

In that case, combination of Lorentz’s Equation \( \vec{F} = Q \vec{E}_0 + Q \vec{V} \times \vec{B} \) and \( \vec{F} = m_0 \ddot{a} \) (see reference 1, p.78-Eq.(2.05)) gives

\[
q = m_0 V = m_0 \frac{Q}{m_0} \frac{(E_0 + \vec{V} \times \vec{B})}{m_0} \Delta t \quad (A1)
\]

In the particular case of an oscillating particle (frequency \( f, \Delta t = 1/f \)) we have

\[
q = \frac{Q(E_0 + \vec{V} \times \vec{B})}{f} \quad (A2)
\]

Let us consider a parallel-plate capacitor where \( d \) is the distance between the plates; \( \Delta V \) is the applied voltage; \( E_0 = \Delta V / d \) is the external electric field. Inside the dielectric the electric field is \( E = \sigma / \varepsilon = E_0 / \varepsilon \), where \( \sigma \) (in C/m\(^2\)) is the density of electric charge and \( \varepsilon = \varepsilon_r \varepsilon_0 \).

Thus the charge \( Q \) on each surface of the dielectric is given by \( Q = \sigma S \) (\( S \) is the area of the surface). Then we have

\[
Q = \sigma S = (E \varepsilon) S = (E \varepsilon \varepsilon_0) S = E_0 \varepsilon_0 S \quad (A3)
\]

Within the field \( E_0 \), the charge \( Q \) (or “charge layer”) acquire a momentum \( q \), according to Eq.(A2), given by

\[
q = \frac{Q E_0}{f} = \frac{E_0^2 \varepsilon_0 S}{f} = \frac{(\Delta V/d)^2 \varepsilon_0 S}{f} \quad (A4)
\]

Assuming that in the dielectric of the capacitor there is \( N \) layers of dipoles with thickness \( \xi \) approximately equal to the diameter of the atoms, i.e., \( N^* = d/\xi \approx 10^{10} d \) then, according to Eq.(1), for \( q >> m_c \), the gravitational mass \( m^*_g \) of each dipole layer is

\[
m^*_g \equiv -2 \left( \frac{q}{m_c} \right) m^*_g \equiv -\frac{2q}{c} \equiv -2 \left( \frac{\Delta V}{d} \right)^2 \varepsilon_0 S f c \quad (A5)
\]

Thus, the total gravitational mass \( m^*_g \) of the dielectric may be written in the form

\[
m^*_g = N^* m^*_g \equiv -2 \times 10^{10} \left( \frac{\varepsilon_0 S}{f c d} \right) \Delta V^2 \quad (A6)
\]

For example, if we have \( \Delta V = 50KV; S = 0.01m^2; f \approx 10^2 Hz; d = 1mm \) Eq.(A6) gives

\[
m^*_g \equiv -0.15kg
\]

Possibly this is the explanation for the Biefeld-Brown Effect.