Repulsive Gravitational Force Field

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A method is proposed in this paper to generate a repulsive gravitational force field, which can strongly repel material particles and photons of any frequency. By repelling particles and photons, including in the infrared range, this force field can work as a *perfect thermal insulation*. It can also work as a *friction reducer with the atmosphere*, for example, between an aeronave and the atmosphere. A spacecraft with this force field around it cannot be affected by any external temperature and, in this way, *it can even penetrate (and to exit) the Sun*, for example, without be damaged or to cause the death of the crew. The generation of this force field is based on the reversion and intensification of gravity by electromagnetic means.

Key words: Quantum Gravity, Gravitation, Gravity Control, Repulsive Force Field.

1. Introduction

The Higgs field equations are [1]:

$$\nabla_\mu \nabla^\mu \varphi_a + \tfrac{1}{2}\left(m_0^2 - f^2 \varphi_b \varphi_b\right)\varphi_a = 0 \qquad (1)$$

Assuming that mass m_0 is the gravitational mass m_g, then we can say that in Higgs field the term $m_g^2 < 0$ arises from a product of positive and negative gravitational masses $(m_g)(-m_g) = -m_g^2$, however it is not an imaginary particle. Thus, when the Higgs field is decomposed, the positive gravitational mass is called *particle*, and spontaneous gives origin to the *mass*; the *negative* gravitational mass is called "dark matter". The corresponding Goldstone boson is $(+m_g)+(-m_g)=0$, which is a symmetry, while the Higgs mechanism is spontaneously broken symmetry. Thus, the existence of the Higgs bosons [2] implies in the existence of *positive gravitational mass* and *negative gravitational mass*.

On the other hand, the existence of negative gravitational mass implies in the existence of *repulsive gravitational force*. Both in the Newton theory of gravitation and in the General Theory of Relativity the gravitational force is exclusively attractive one. However, the *quantization of gravity* shows that the gravitational forces can also be *repulsive* [3].

Based on this discovery, here we describe a method to generate a *repulsive gravitational force field* that can strongly repel material particles and photons of any frequency. It was developed starting from a process *patented* in July, 31 2008 (BR Patent Number: PI0805046-5) [4].

2. Theory

In a previous paper [5] it was shown that, if the *weight* of a particle in a side of a lamina is $P = m_g g$ then the weight of the same particle, in the other side of the lamina is $P' = \chi m_g g$, where $\chi = m_g / m_{i0}$ (m_g and m_{i0} 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 Gravitational Shielding. This is the *Gravitational Shielding* effect. Since $P' = \chi P = (\chi m_g)g = m_g(\chi g)$, we can consider that $m_g' = \chi m_g$ or that $g' = \chi g$.

If we take two parallel gravitational shieldings, with χ_1 and χ_2 respectively, then the gravitational masses become: $m_{g1} = \chi_1 m_g$, $m_{g2} = \chi_2 m_{g1} = \chi_1 \chi_2 m_g$, and the gravity will be given by $g_1 = \chi_1 g$, $g_2 = \chi_2 g_1 = \chi_1 \chi_2 g$. In the case of multiples gravitational shieldings, with $\chi_1, \chi_2, \ldots, \chi_n$, we can write that, after the n^{th} gravitational shielding the gravitational mass, m_{gn}, and the gravity, g_n, will be given by

$$m_{gn} = \chi_1 \chi_2 \chi_3 \ldots \chi_n m_g, \quad g_n = \chi_1 \chi_2 \chi_3 \ldots \chi_n g \quad (2)$$

This means that, n superposed gravitational shieldings with different $\chi_1, \chi_2, \chi_3, \ldots, \chi_n$ are equivalent to a single gravitational shielding with $\chi = \chi_1 \chi_2 \chi_3 \ldots \chi_n$.

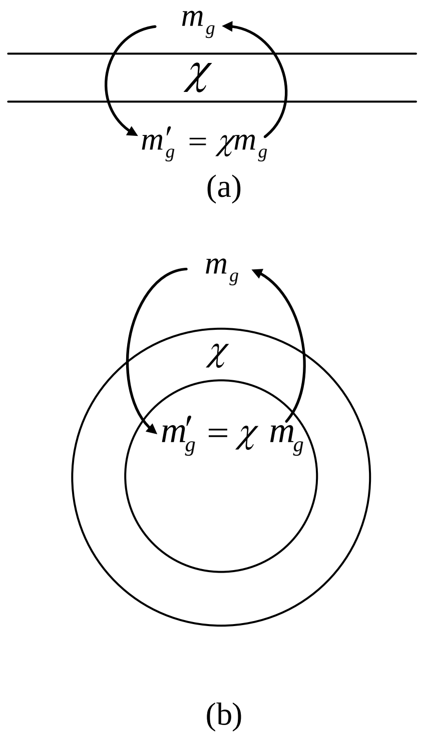

Fig. 1 – *Plane* and *Spherical* Gravitational Shieldings. When the radius of the gravitational shielding (b) is very small, any particle inside the spherical crust will have its gravitational mass given by $m'_g = \chi \, m_g$, where m_g is its gravitational mass out of the crust.

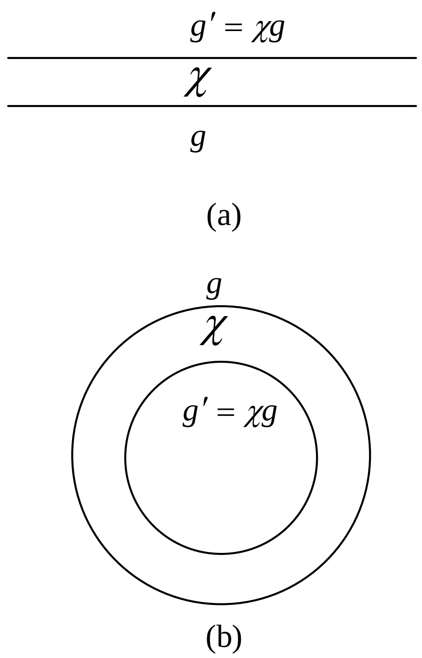

Fig. 2 – The gravity acceleration in both sides of the gravitational shielding.

The quantization of gravity shows that the *gravitational mass* m_g and *inertial mass* m_i are correlated by means of the following factor [3]:

$$\chi = \frac{m_g}{m_{i0}} = \left\{ 1 - 2\left[\sqrt{1 + \left(\frac{\Delta p}{m_{i0} c} \right)^2} - 1 \right] \right\} \tag{3}$$

where m_{i0} is the *rest* inertial mass of the particle and Δp is the variation in the particle's *kinetic momentum*; c is the speed of light.

In general, the *momentum* variation Δp is expressed by $\Delta p = F \Delta t$ where F is the applied force during a time interval Δt. Note that there is no restriction concerning the *nature* of the force F, i.e., it can be mechanical, electromagnetic, etc.

For example, we can look on the *momentum* variation Δp as due to absorption or emission of *electromagnetic energy*. In this case, by substitution of $\Delta p = \Delta E / v = \Delta E / v (c/c)(v/v) = \Delta E n_r / c$ into Eq. (1), we get

$$\chi = \frac{m_g}{m_{i0}} = \left\{ 1 - 2\left[\sqrt{1 + \left(\frac{\Delta E}{m_{i0} c^2} n_r \right)^2} - 1 \right] \right\} \tag{4}$$

By dividing ΔE and m_{i0} in Eq. (4) by the volume V of the particle, and remembering that, $\Delta E / V = W$, we obtain

$$\chi = \frac{m_g}{m_{i0}} = \left\{ 1 - 2\left[\sqrt{1 + \left(\frac{W}{\rho \, c^2} n_r \right)^2} - 1 \right] \right\} \tag{5}$$

where ρ is the matter density $\left(kg/m^3 \right)$.

Based on this possibility, we have developed a method to generate a *repulsive gravitational force field* that can strongly repel material particles and photons of any frequency.

In order to describe this method we start considering figure 3, which shows a set of n spherical gravitational shieldings, with $\chi_{1,} \chi_{2,} ..., \chi_n$, respectively. When these gravitational shielding are *deactivated*, the gravity generated is $g = -G m_{gs} / r^2 \cong -G m_{i0s} / r^2$, where m_{i0s} is the total inertial mass of the n spherical gravitational shieldings. When the system is *actived*, the gravitational mass becomes $m_{gs} = (\chi_1 \chi_2 ... \chi_n) m_{i0s}$, and the gravity is given by

$$g' = (\chi_1 \chi_2 ... \chi_n) g = -(\chi_1 \chi_2 ... \chi_n) G m_{i0s} / r^2 \tag{6}$$

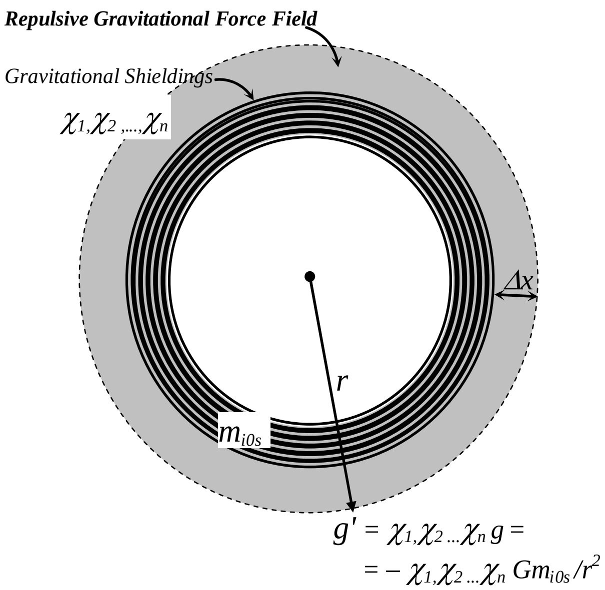

Fig. 3 – *Repulsive Gravitational Field Force* produced by the Spherical Gravitational Shieldings (*1*, *2*,…, *n*).

If we make $(\chi_1 \chi_2 ... \chi_n)$ *negative* (n odd) the gravity g' becomes *repulsive*, producing a pressure p upon the matter around the sphere. This pressure can be expressed by means of the following equation

$$p = \frac{F}{S} = \frac{m_{i0(matter)} g'}{S} = \frac{\rho_{i(matter)} S \Delta x g'}{S} =$$
$$= \rho_{i(matter)} \Delta x g' \qquad (7)$$

Substitution of Eq. (6) into Eq. (7), gives

$$p = -(\chi_1 \chi_2 ... \chi_n) \rho_{i(matter)} \Delta x \left(G m_{i0s} / r^2 \right) \qquad (8)$$

If the matter around the sphere is the atmospheric air ($p_a = 1.013 \times 10^5 N.m^{-2}$), then, in order to expel all the atmospheric air from the inside the belt with Δx - thickness (See Fig. 3), we must have $p > p_a$. This requires that

$$(\chi_1 \chi_2 ... \chi_n) > \frac{p_a r^2}{\rho_{i(matter)} \Delta x G m_{i0s}} \qquad (9)$$

Satisfied this condition, *all* the matter is expelled from this region, except the *Continuous Universal Fluid* (CUF), which density is $\rho_{CUF} \cong 10^{-27} kg.m^{-3}$ [6].

Thus, if an electric field with intensity E is applied on this region, then, according to Eq. (5), this belt becomes a new gravitational shielding with χ, given by

$$\chi = \frac{m_g}{m_{i0}} = \left\{ 1 - 2 \left[\sqrt{1 + \left(\frac{\varepsilon_0 E^2}{\rho_{CUF} c^2} n_r \right)^2} - 1 \right] \right\} \qquad (10)$$

Now, if we activate this gravitational shielding *simultaneously* with another additional gravitational shielding, χ_a, (χ_a *negative*), inside the set of n gravitational shieldings, then, in the border of the region of Δx - thickness, the gravity becomes

$$g'' = -\chi (\chi_a \chi_1 \chi_2 ... \chi_n) G M_{i0s} / r^2 \qquad (11)$$

which is *positive* because $(\chi_1 \chi_2 ... \chi_n)$ is *negative* (n odd), and χ_a, χ are negative. This means that a *repulsive* gravity, g'', will act from the border of the region of Δx - thickness forward. This prevents the return of the matter initially repelled from the region of Δx - thickness. Inside this region the gravity becomes now *attractive*, and given by $g' = -(\chi_a \chi_1 \chi_2 ... \chi_n) G M_{i0s} / r^2$, ($M_{i0s}$ includes the mass of the gravitational shielding with χ_a).

The General Relativity shows that photons are deviated of an angle δ when they pass close to the Sun. The expression of δ is [7]

$$\delta = -\frac{4 G M_{gs}}{c^2 r} \qquad (12)$$

This effect is general for any body. Thus, in the case of the set of n spherical gravitational shieldings with $\chi_1, \chi_2, ..., \chi_n$, more the additional gravitational shieldings with χ_a and χ, the photons are deviated of an angle δ (See Fig.4), given by

$$\delta = -\frac{4 G M_{gs}}{c^2 r} = -\frac{4 G M_{gs} r}{c^2 r^2} = \frac{4 g'' r}{c^2} \qquad (13)$$

By substitution of Eq. (11) into Eq. (13), we get

$$\delta = \frac{-4 \chi (\chi_a \chi_1 \chi_2 ... \chi_n) G M_{i0s}}{c^2 r} \qquad (14)$$

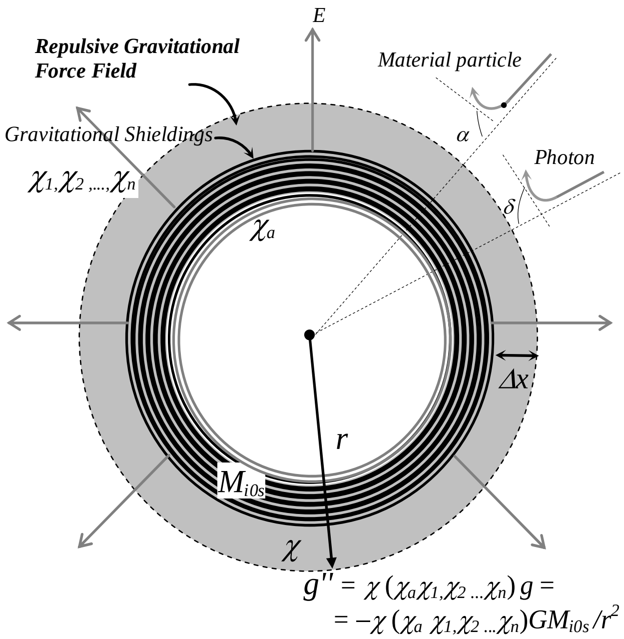

Fig. 4 – *Repulsive Gravitational Field Force* produced when the electric field *E* is *simultaneously* actived with the additional gravitational shielding *a*. In this circumstances, besides the gravitational shieldings with $\chi_1,\chi_2,...,\chi_n$, there are *two* additional gravitational shielding with χ_a *and* χ, respectively .

For $\delta > \pi/2$, Eq. (14) shows that we must have

$$\chi(\chi_a\chi_1\chi_2...\chi_n) > -\frac{\pi\ c^2 r}{8GM_{i0s}} \qquad (15)$$

Satisfied this condition, *all* the *photons* and *particles* are expelled from the region of Δx -thickness.

By repelling *particles* and photons, including in the *infrared* range, this force field can work as a *perfect thermal insulation*. It can also work as a *friction reducer with the atmosphere*, for example, between an aeronave and the atmosphere. A spacecraft with this force field around it cannot be affected by any external temperature and, in this way, *it can even penetrate (and to exit) the Sun*, for example, without be damaged or to cause the death of the crew.

Assuming,

$$\chi(\chi_a\chi_1\chi_2...\chi_n) = -0.5c^2 r/GM_{i0s} \qquad (16)$$

and considering equation (7) , which shows that $p_a = -\chi(\chi_a\chi_1\chi_2...\chi_n)\rho_{i(matter)}\Delta x(GM_{i0s}/r^2)$, we can write that

$$\Delta x = -\frac{p_a r^2}{\chi(\chi_a\chi_1\chi_2...\chi_n)\rho_{i(matter)}GM_{i0s}} =$$

$$= -\frac{p_a r^2}{(-0.5c^2 r/GM_{i0s})\rho_{i(matter)}GM_{i0s}} =$$

$$= \frac{2p_a r}{c^2\rho_{i(matter)}} \qquad (17)$$

For $r = 6m$, Eq. (17) gives

$$\Delta x = 1.2\times 10^{-11}m \qquad (18)$$

According to Eq. (10) the maximum value for χ is limited by the dielectric strength of the matter in the region of Δx-thickness. In the case of air, $E_{\max} = 1KV/mm$. Therefore, Eq. (10), gives

$$\chi = -1.97\times 10^{11} \qquad (18)$$

By substitution of this value into Eq. (16), we get

$$(\chi_a\chi_1\chi_2...\chi_n) = \frac{2.05\times 10^{16}}{M_{i0s}} \qquad (19)$$

The gravitational shieldings $(a,1,2,..,n)$ can be made very thin, in such way that the total inertial mass of them, in the case of $r \cong 6m$, can be assumed as $M_{i0s} \cong 5000kg$. Thus, equation above gives

$$(\chi_a\chi_1\chi_2...\chi_n) \cong 4.1\times 10^{12} \qquad (20)$$

By making $\chi_a = \chi_1 = \chi_2 = ... = \chi_n$, we obtain

$$\chi_a^{n+1} \cong 4.1\times 10^{12} \qquad (21)$$

For $n = 7$, we obtain the following value

$$\chi_a = \chi_1 = \chi_2 = ... = \chi_7 = -37.7 \qquad (22)$$

It is relatively easy to build the set of spherical gravitational shieldings with these values. First we must choose a convenient material, with density ρ and refraction index n_r, in such way that, by applying an electromagnetic field E sufficient intense, we can obtain, according to Eq. (5), the values given by Eq. (22).

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