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, while creating a gravitational shielding that can nullify the *momentum* of incident particles (including photons). By nullifying the *momentum* of the *particles* and *photons*, including in the *infrared* range, this force field can work as a *perfect thermal insulation*. This means that, 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* without be damaged or to cause the death of the crew. The repulsive force field can also work as a *friction reducer with the atmosphere* (between an aeronave and the atmosphere), which allows traveling with very high velocities through the atmosphere without overheating the aeronave. The generation of this force field is based on the reversion and intensification of gravity by electromagnetic means.

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 $\left(m_g\right)\left(-m_g\right) = -m_g^2$, 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 $\left(+m_g\right) + \left(-m_g\right) = 0$, 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 $P' = \chi P = \left(\chi m_g\right) g = m_g\left(\chi g\right)$, 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 $\chi_1, \chi_2, ..., \chi_n$, we can write that, after the nth gravitational shielding the gravitational mass, m_{gn}, and the gravity, g_n, will be given by

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

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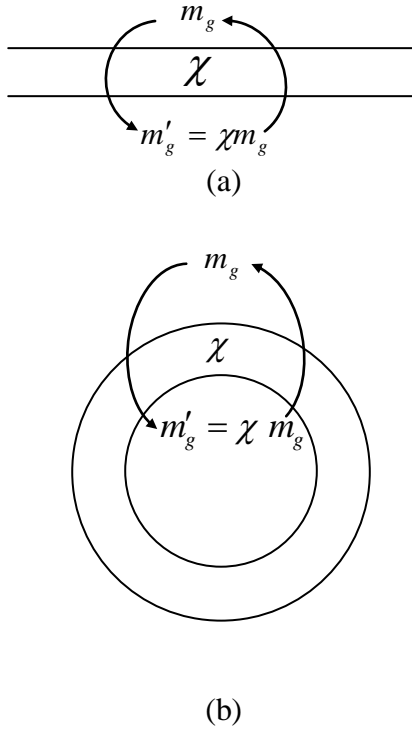
(a)

(b)

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.
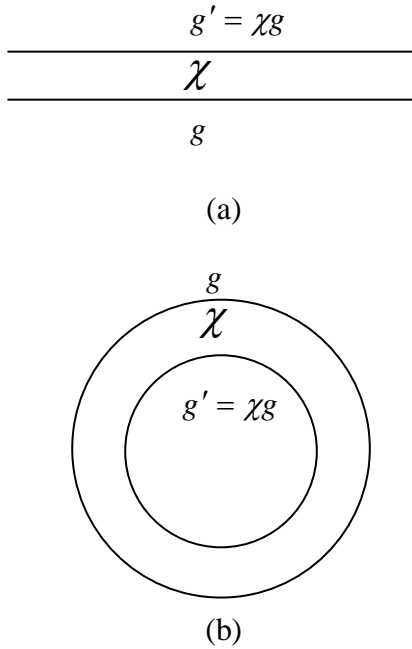

(a)

(b)

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]:

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

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, substitution of $\Delta p = \Delta E/v = \Delta E/v(c/c)(v/v) = \Delta E n_r/c$ into Eq. (1), gives

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

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

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

where ρ is the matter density (kg/m^3).

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

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 $g = -Gm_{gs}/r^2 \cong -Gm_{i0s}/r^2$, 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

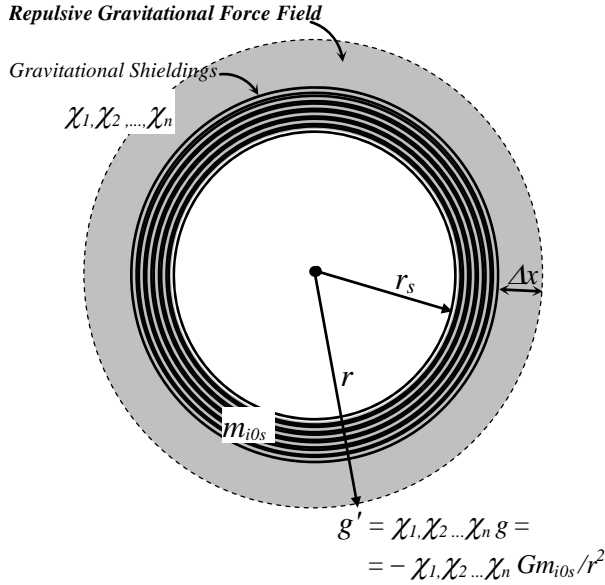$$g' = (\chi_1 \chi_2 ... \chi_n)g = -(\chi_1 \chi_2 ... \chi_n)Gm_{i0s}/r^2 \qquad (6)$$

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

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

If the matter around the sphere is only 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

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

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].

The density of the Universal Quantum Fluid is clearly *not uniform* along the Universe. At *supercompressed* state, it gives *origin* to the *known matter* (quarks, electrons, protons, neutrons, etc). Thus, the *gravitational mass* arises with the supercompression state. At the normal state (free space, far from matter), the local *inertial mass* of Universal Quantum Fluid does not generate gravitational mass, i.e., $\chi = 0$. However, if some bodies are placed in the neighborhoods, then this value will become greater than zero, due to *proximity effect,* and the gravitational mass will have a non-null value. This is the case of the region with Δx - thickness, i.e., in spite of *all* the matter be expelled from the region, remaining in place just the Universal Quantum Fluid, the proximity of neighboring matter makes non-null the gravitational mass of this region, but extremely close to zero, in such way that, the value of $\chi = m_g/m_{i0}$ is also extremely close to zero (m_{i0} is the inertial mass of the Universal Quantum Fluid in the mentioned region).

Another important equations obtained in the quantization theory of gravity is the new expression for the *momentum* q and *gravitational energy* of a particle with gravitational mass M_g and velocity v, which is given by [3]

$$\vec{q} = M_g\vec{v} \qquad (10)$$

$$E_g = M_g c^2 \qquad (11)$$

where $M_g = m_g\big/\sqrt{1-v^2/c^2}$; m_g is given by Eq.(1), i.e., $m_g = \chi m_i$. Thus, we can write

$$M_g = \frac{\chi m_i}{\sqrt{1-v^2/c^2}} = \chi M_i \qquad (12)$$

Substitution of Eq. (12) into Eq. (11) and Eq. (10) gives

$$E_g = \chi M_i c^2 \qquad (13)$$

$$\vec{q} = \chi M_i \vec{v} = \frac{\vec{v}}{c} \chi \frac{h}{\lambda} \qquad (14)$$

For $v = c$, the *momentum* and the energy of the particle become infinite. This means that a particle with non-null mass cannot travel with the light speed. However, in Relativistic Mechanics there are particles with *null mass* that travel with the light speed. For these particles, Eq. (14) gives

$$q = \chi \frac{h}{\lambda} \qquad (15)$$

Note that only for $\chi = 1$ the Eq. (15) is reduced to the well=known expressions of DeBroglie $(q = h/\lambda)$.

Since the factor χ can be strongly reduced under certain circumstances (See Eq.(1)), then according to the Eqs. (13) and (14), the *gravitational energy* and the *momentum* of a particle can also be strongly *reduced*. In the case of the region with Δx - thickness, where χ is *extremely close to zero*, the *gravitational energy* and the *momentum* of the *material particles* and *photons* become practically *null*.

By nullifying the *gravitationa*l *energy* and the *momentum* of the *particles* and *photons*, including in the *infrared* range, this force field can work as a *perfect thermal insulation*. This means that, 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* without be damaged or to cause the death of the crew. The repulsive force field can also work as a *friction reducer with the atmosphere* (between an aeronave and the atmosphere), which allows traveling with very high velocities through the atmosphere without overheating the aeronave.

Considering Eq. (8), for $p = p_a$ at $r = 6m$, we can write that

$$(\chi_1 \chi_2 ... \chi_n) = -\frac{36 p_a}{\Delta x \rho_{i(matter)} G M_{i0s}} \qquad (16)$$

The gravitational shieldings $(1, 2, .., n)$ can be made very thin, in such way that the total inertial mass of them, for example in the case of $r_s \cong 4.9m$, can be assumed as $M_{i0s} \cong 5000 kg$.

Thus, for $\Delta x = 1m$ and $\rho_{i(matter)} = 1.2 kg.m^{-3}$, Eq. (16) gives

$$(\chi_1 \chi_2 ... \chi_n) = -9.1 \times 10^{12} m \qquad (17)$$

By making $\chi_1 = \chi_2 = ... = \chi_n$, then, for $n = 7$, we obtain the following value

$$\chi_1 = \chi_2 = ... = \chi_7 = -71.00 \qquad (22)$$

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 $(W = \varepsilon_0 E^2)$, we can obtain, according to Eq. (5), the values given by Eq. (22).

Since in the region with Δx - thickness, the value of χ is extremely close to zero, we can conclude that the gravitational mass of the spacecraft, which is given by $m_{gs} = \chi(\chi_1 \chi_2 ... \chi_n) m_{i0s}$, becomes very small. This makes possible to the spacecraft acquire strong accelerations, even when subjected to small thrusts $(a = F/m_{gs})$[3]. On the other hand, with a small gravitational mass, the weight of the spacecraft will be also small.

Note that the Gravitational Repulsive Force Field aggregates new possibilities to the *Gravitational Spacecraft*, previously proposed [7], while showing that the performance of this spacecraft goes much beyond the conventional spacecrafts.

References

[1] Higgs, P. W. (1966) *Phys. Rev.* 145, 1156.

[2] CERN (2012) *Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC*, Phys. Lett. B 716 (2012) 30.

[3] De Aquino, F. (2010) *Mathematical Foundations of the Relativistic Theory of Quantum Gravity*, Pacific Journal of Science and Technology, **11** (1), pp. 173-232.

[4] De Aquino, F. (2008) *Process and Device for Controlling the Locally the Gravitational Mass and the Gravity Acceleration*, BR Patent Number: PI0805046-5, July 31, 2008.

[5] De Aquino, F. (2010) *Gravity Control by means of Electromagnetic Field through Gas at Ultra-Low Pressure*, Pacific Journal of Science and Technology, **11**(2) November 2010, pp.178-247, Physics/0701091.

[6] De Aquino, F. (2011) *The Universal Quantum Fluid*, http://vixra.org/abs/1202.0041

[7] De Aquino, F. (1998) *The Gravitational Spacecraft*, Electric Spacecraft Journal (USA) Volume 27, December 1998 (First Version), pp. 6-13. http://arXiv.org/abs/physics/9904018