Invention Patent of the

“PROCESS AND DEVICE FOR CONTROLLING LOCALLY THE GRAVITATIONAL MASS AND THE GRAVITY ACCELERATION”.

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Place: S.Luís/MA-Brasil.

“PROCESS AND DEVICE FOR CONTROLLING LOCALLY THE GRAVITATIONAL MASS AND THE GRAVITY ACCELERATION”.

This invention, called “Gravity Control Cell”, refers to a process and an electro-electronic system that has the property of reducing, annulling, inverting and increasing the intensity of the local gravity acceleration.

The “Gravity Control Cell” results from the discovery of the existence of a *correlation* between the gravitational mass and the inertial mass – published in 2006 in the article “Mathematical Foundations of the Relativistic Theory of Quantum Gravity”, Copyright ©2007 by Fran Garcia de Aquino Filho, available on: arXiv-physics/0212033 and detailed in the article “Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**”,** Copyright © 2007 by Fran Garcia de Aquino Filho, available on: arxiv – physics /0701091. The “Gravity Control Cell” had its idealization immediately after the publication of the first article above mentioned in which it is shown that *any substance* subjected to the action of an *oscillating electromagnetic field* has its gravitational mass reduced and the gravity acceleration in any transversal direction to the substance is reduced at the same proportion of the gravitational mass reduction. According to this principle, here called *General Principle of Gravity Control,* the change in the gravitational mass of the substance and in the gravity acceleration in any transversal direction to the substance is directly proportional to the product of the electromagnetic energy density applied to the substance for the refraction index, and inversely proportional to the mass density of the substance (q.v. “Mathematical Foundations of the Relativistic Theory of Quantum Gravity”). The use of gas at ultra-low pressure comes from the fact that gases have low mass density and, the smaller the pressure, also smaller the mass density of the gas.

For several years, gravitation and/or gravitational control have been exhaustively researched. Some patents referring to possible "anti-gravitational" systems or devices have been deposited. For example, the patents: PI9904625 (Brazilian), P2000-110706A (Japanese), DE19832001A1 (German) e PI0302764-3(Brazilian). Most of them come from mistaken or groundless speculations and, as it is known, none of them have obtained success.

The "Gravity Control Cell" is a new and unprecedented device in the literature. From the technological viewpoint, there are several utilizations for this invention; possibly it will change the paradigms of *energy generation*, *transportation* and *telecommunications.*

As shown in article "Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**",** the "Gravity Control Cell" can be used to convert gravitational energy into rotational mechanic energy, and, starting from this *Gravitational Motor*, generate electric energy by means of a conventional electric generator coupling to the *Gravitational Motor*. They also can be used to produce *thrust.* In this case, the thruster system, called *Gravitational Thruster*, can produce thrust up to several hundred of Kilonewtons. These gravitational thrusters can be used as basic elements of thrust in several transportation systems; also they can be used in several industrial processes. Probably this technology will be used in a great number of areas of human activity. They can also be used in the construction of an Ultra-high Gravitational Press, as shown in the article "Gravity Control by means of *Electromagnetic Field* through Gas at Ultra-Low Pressure**".** In aerospatial vehicles and spacecrafts they will have several utilizations, one of them, for example, being the production of *artificial gravity* inside the spacecraft. As a consequence of the General Principle of gravity Control and of the "Gravity Control

Cells", a new concept of spacecraft and aerospatial flight arises as well as a new benefit for the Telecommunications area, with the possibility of building transmitters and receivers that work based on the gravity control method here described. These systems can also be designed for *wireless electrical power transmission* as shown in the article "Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**"**. The description that follows and the associated figures will viabilize the understanding of the invention very well.

Figure 1 (a) shows a schematic cross section of a type of "Gravity Control Cell". Figure 1 (b) shows a schematic diagram of a battery with 3(three) "Gravity Control Cell". In the article "*Mathematical Foundations of the Relativistic Theory of Quantum Gravity*", it was demonstrated that the gravitational mass m_g is correlated with the inertial mass m_i by means of the following expression

$$m_g = m_i - 2\left[\sqrt{1+\left(\frac{\Delta p}{m_i c}\right)^2} - 1\right] m_i . \qquad (1)$$

Where Δp is the particle's *momentum* variation.

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* by the particle.

In the case of radiation, Δp can be obtained as follows. It is known that the *radiation pressure*, dP, upon an area $dA = dxdy$ of a volume $dV = dxdydz$ of a particle (the incident radiation normal to the surface dA) is equal to the energy dU absorbed per unit volume (dU/dV).i.e.,

$$dP = \frac{dU}{dV} = \frac{dU}{dxdydz} = \frac{dU}{dAdz} \qquad (2)$$

Substitution of $dz = vdt$ (v is the speed of radiation) into the equation above gives

$$dP = \frac{dU}{dV} = \frac{(dU/dAdt)}{v} = \frac{dD}{v} \qquad (3)$$

Since $dPdA = dF$, we can write:

$$dFdt = \frac{dU}{v} \qquad (4)$$

However, we know that $dF = dp/dt$, then

$$dp = \frac{dU}{v} \qquad (5)$$

From this equation, it follows that

$$\Delta p = \frac{U}{v}\left(\frac{c}{c}\right) = \frac{U}{c} n_r$$

Substitution into Eq. (1) yields

$$m_g = \left\{1 - 2\left[\sqrt{1 + \left(\frac{U}{m_{i0}c^2} n_r\right)^2} - 1\right]\right\} m_{i0} \qquad (6)$$

Where U is the electromagnetic energy absorbed by the particle; n_r is the index of refraction. Equation (6) can be rewritten in the following form

$$m_g = \left\{1 - 2\left[\sqrt{1 + \left(\frac{W}{\rho\, c^2} n_r\right)^2} - 1\right]\right\} m_{i0} \qquad (7)$$

Where $W = U/V$ is the *density of electromagnetic energy*, and $\rho = m_{i0}/\mathrm{V}$ is the density of inertial mass.

In Classical Mechanics, the energy density inside an electromagnetic field has the following expression

$$W = \tfrac{1}{2}\varepsilon\, E^2 + \tfrac{1}{2}\mu H^2$$

Since $E/H = \mu\, c$, then we can write that

$$W = \mu_r \mu_0 H^2 = \mu H^2$$

Thus, we can rewrite Eq. 7 as follows

$$m_g = \left\{1 - 2\left[\sqrt{1 + \left(\frac{\mu H^2}{\rho\, c^2} n_r\right)^2} - 1\right]\right\} m_i \qquad (8)$$

The Electrodynamics tells us that v will be given by

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

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 ($\varepsilon = \varepsilon_r \varepsilon_0$ where ε_r is the

relative dielectric permittivity and $\varepsilon_0 = 8.854 \times 10^{-12} F/m$; $\mu = \mu_r \mu_0$ where μ_r is the *relative magnetic permeability* and $\mu_0 = 4\pi \times 10^{-7} H/m$; σ is the *electrical conductivity*).

It is then evident that the *refraction index* $n_r = c/v$ will be given by

$$n_r = \frac{c}{v} = \sqrt{\frac{\varepsilon_r \mu_r}{2}\left(\sqrt{1+(\sigma/\omega\varepsilon)^2}+1\right)} \tag{9}$$

Now, consider a chamber filled with *Air* at $3 \times 10^{-12}\, torr$ and 300K as shown in Figure 1 (a). Under these circumstances, the *mass density* of the *air* inside the chamber is $\rho \cong 5 \times 10^{-15}\, kg.m^{-3}$. If the frequency of the *magnetic* field, H , through the *air* is $f = 60Hz$ then $\omega\varepsilon = 2\pi f\varepsilon \cong 3 \times 10^{-9}\, S/m$. Assuming that the electric conductivity of the *air* inside the chamber, $\sigma_{(air)}$ is much less than $\omega\varepsilon$, i.e., $\sigma_{(air)} << \omega\varepsilon$ (the atmospheric air conductivity is of the order of $2 - 100 \times 10^{-15}\, S.m^{-1}$), then we can rewrite Eq. (9) as follows

$$n_r \cong \sqrt{\varepsilon_r \mu_r} \cong 1 \tag{10}$$

Consequently, from Equation (8), we get

$$m_{g(air)} = \left\{1 - 2\left\lfloor\sqrt{1+3\times10^6 B^4} - 1\right\rfloor\right\} m_{i(air)}$$

It was shown in the first article above mentioned that there is an additional effect of *gravitational shielding* produced by a substance under these conditions. For example, above the substance the gravity acceleration g' is reduced at the same ratio $\chi = m_g / m_i$, i.e., $g' = \chi g$, (g is the gravity acceleration *under* the *substance*). Therefore, due to the

gravitational shielding effect produced by the decrease of $m_{g(air)}$ the gravity acceleration just *above* the air inside the box will be given by

$$g' = \chi_{air}\, g = \frac{m_{g(air)}}{m_{i(air)}} g = \\ = \left\{1 - 2\left[\sqrt{1 + 3\times 10^{6} B^{4}} - 1\right]\right\} g$$

Note that the gravity acceleration above the *air* becomes *negative* for $B > 2.5\times 10^{-2} T$.

For $B = 0.1T$ the gravity acceleration above the air is intensified up to

$$g' \cong -31.7\, g$$

Therefore, the box with air at ultra-low pressure works as a "Gravity Control Cell". Note that below and above the *air* are the bottom and the top of the chamber. Therefore, the choice of the material of the chamber is highly relevant. If the chamber is made of steel, for example, and the gravity acceleration below the chamber is g, then, at the bottom of the chamber, the gravity becomes $g' = \chi_{steel}\, g$; in the air, the gravity is $g'' = \chi_{air} g' = \chi_{air}\chi_{steel} g$. At the top of the chamber, $g''' = \chi_{steel} g'' = (\chi_{steel})^2 \chi_{air} g$. Thus, out of the chamber (close to the top) the gravity acceleration becomes g'''. (See Fig. 1 (a)). However, for the steel at $B < 300T$ and $f = 1\times 10^{-6} Hz$, we have

$$\chi_{steel} = \frac{m_{g(steel)}}{m_{i(steel)}} = \left\{1 - 2\left[\sqrt{1 + \frac{\sigma_{(steel)} B^{4}}{4\pi f \mu \rho_{(steel)}^{2} c^{2}}} - 1\right]\right\} \cong 1$$

Since $\rho_{steel} = 1.1\times 10^{6}\, S.m^{-1}$, $\mu_r = 300$ and $\rho_{(steel)} = 7800 k.m^{-3}$. Thus, due to $\chi_{steel} \cong 1$ it follows that

$$g''' \cong g'' = \chi_{air}\, g' \cong \chi_{air}\, g$$

If, instead of one “Gravity Control Cell”, we have *three*, all with steel box (Fig. 1(b)), then the gravity acceleration above the *second* cell, g_2, will be given by

$$g_2 \cong \chi_{air} g_1 \cong \chi_{air} \chi_{air} g$$

and the gravity acceleration above the *third* cell, g_3, will be expressed by

$$g_3 \cong \chi_{air} g'' \cong \chi_{air}{}^3 g$$

Figure 2 shows a schematic cross section of a *Gravitational Motor*, which explains the action of the “Gravity Control Cells” in the conversion of gravitational energy into rotational mechanic energy.

Figure 3 shows a schematic cross section of a Gravitational Spacecraft designed starting from the possibility of gravity control based on the General Principle of gravity Control and on the utilization of “Gravity Control Cells”. In this figure, there is a superconducting ring utilized to generate a magnetic field B, whose lines of magnetic flux are expelled of a superconducting “shell”, due to the Meissner effect. The objective of this superconducting “shell” is to expel from the interior of the spacecraft the mentioned lines of magnetic flux. Thus, these lines are concentrated only inside in the aluminum “shell” that involves the Gravitational Spacecraft and, in this way, they can change the gravitational mass of this “shell” so as to provide the control of the gravitational interaction upon the spacecraft, as detailed in the article “Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**”**(Op. cit.). In this figure, it is also shown a “Gravity Control Cell” in the center of the spacecraft. The objective of this device is to produce gravity similar to that in the surface of the Earth, in the case of interstellar flight.

Figure 4 shows a schematic cross section of Gravitational Thruster built starting from “Gravity Control Cells”. When a gas in injected inside the thruster, the gas is

subjected to a gravitational acceleration produced by the mass M, and strongly intensified by means of the “Gravity Control Cells”. In this way, the thrust produced by the Gravitational Thruster can be controlled by means of the “Gravity Control Cells”.

Figure 5 is schematic cross section of a Gravitational Spacecraft in the *terrestrial atmosphere*. The objective in this case is to show the possibility of creating an *artificial atmosphere* around the spacecraft in order to avoid the direct attrition between the aluminum “shell” of the spacecraft (shown in Fig.3) and the terrestrial atmosphere. In this case, the attrition occurs only between the *artificial atmosphere* and the atmospheric air which is around it. In this way, it is possible to avoid the super heating of the spacecraft during the hypersonic flights as shown in the article “Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**”** (Op. cit.).

Figure 6 is also a schematic cross section of a Gravitational Spacecraft in the terrestrial atmosphere. In this case, the objective is to show that bodies can be lifted up to the spacecraft by means of the gravitational action produced by the magnetic field B of the spacecraft upon the bodies below it.

Figure 7 shows a cross section in a Gravitational Press. Two “Gravity Control Cells” intensify the gravity acceleration in such way that the piston of the press can remain subjected to a gravitational force too intense that the pressure produced in the surface S of the piston can surpass the pressure in the center of the Earth ($3.617 \times 10^{11} N.m^{-2}$).

In figures 8(a) , 8(b) , 9(a) and 9(b), schematic diagrams of *Quantum Gravitational Antennas* are presented that show how they work in the transmission and

reception of signs, and how they can be build starting from “Gravity Control Cells” with gas or plasma or by substituting the gas or plasma by solid matter since, according to the General Principle of Gravity Control, the effect of reduction of the gravitational mass can occur in *any substance* subjected an oscillating electromagnetic field.

Figures 1(a) and 1(b) have the basic function of aiding in the theoretical and technical descriptions of the functioning of the invention described in the article “Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**”** (Op. cit.).

Figure 10 shows the schematic diagram of some types of “Gravity Control Cells” (GCC). In the figure 10(a), it is shown a GCC in which the low-frequency electric field and the *ionizing* field can be the same. In figure 10(b), it is shown a GCC where the plasma is ionized by means of a radio-frequency sign (RF). In figure 10(c), it is shown an important type of “Gravity Control Cells” with gas strongly *ionized*, confined inside the GCC, at normal conditions of temperature and pressure (1atm, 25ºC), subjected to an oscillating magnetic or electric field (electromagnetic field). In this case, the ionization is produced by means of alpha particles emitted from a source of radioactive ions, for example, the radioactive element Americium (Am 241).

In figure 11, it is shown the schematic diagram of the *Turbo Gravitational Motor*. In this case, the gas, gravitationally accelerated by means of “Gravity Control Cells”, propels the helix, which moves the axis of the motor.

CLAIMS:

1. “Gravity Control Cell”, characterized by having gas or plasma confined at ultra-low pressure or *ionized gas* confined at normal conditions of temperature and pressure (1atm, 25ºC), subjected to an oscillating magnetic or oscillating electric field (electromagnetic filed) of low-frequency (figure 1(a)), obtaining decrease in the *gravitational mass* of the confined gas and consequently, due to the *gravitational shielding effect*, reducing the gravity acceleration in any transversal direction to the gas in the same proportion in which the gravitational mass of the gas is reduced, with the objective of to reduce, to annul, to invert and to intensify the gravity acceleration in any direction.

2. “Gravity Control Cell”, characterized by having one or more conducting or superconducting inductors aimed at generating the electromagnetic field across the confined gas or plasma, that has any other geometrical forms non-circulars, always having as principal objective to obtain the decrease of the gravitational mass of the gas or plasma.

3. “Gravity Control Cell”, characterized by maintaining the gas or plasma confined in a chamber or box of conductor, semiconductor or dielectric material, that has any other geometrical shapes non mentioned here, with the objective of obtaining similar or different gravitational effects.

4. “Gravity Control Cell”, characterized by being utilized in a unitary mode, double, triple, or other associated mode, with the objective of intensifying the local gravity acceleration or of producing other different gravitational effects.

5. “Gravity Control Cell”, in accordance with claims 1 or 2 or 3 or 4, characterized by having liquid matter or solid in substitution to the confined gas or plasma, with the objective of obtaining similar or different gravitational effects.

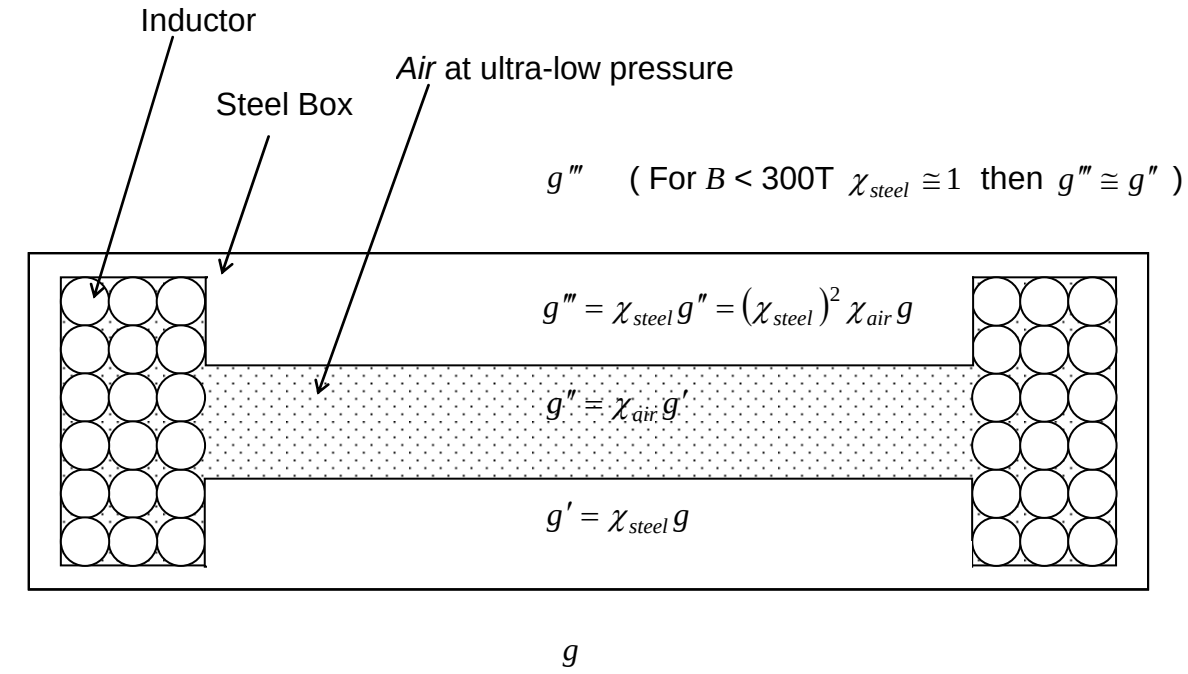
6. “Gravity Control Cell”, in accordance with claims 1 up to 5, characterized by being controlled by means of electronic device that use types of wave forms different from sinusoidal waves, with the objective of producing the electromagnetic field, or by means of a different way of generation of electromagnetic field, so as, for any value of the utilized frequency.

7. Any type of system, machine, device or equipment, for industrial, commercial, residential, aerospatial, medical, or military use, or use in the communications, in the leisure, in the transportation systems or in the general service, characterized by incorporating, as active and/or passive part, one or more “Gravity Control Cell”, which are in agreement with claims 1 to 6.

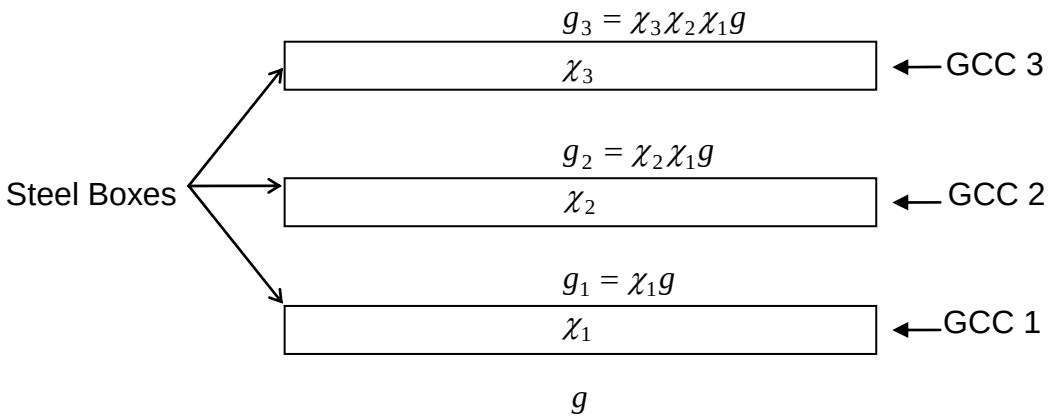
ABSTRACT

This invention, called “Gravity Control Cell”, refers to a process and an electro-electronic system that has the function of controlling locally the intensity of the gravity acceleration. Basically, it consists in a chamber of gas or plasma at ultra-low pressure (ultra-high vacuum) or *ionized* gas confined at normal conditions of temperature and pressure (1 atm, 25ºC), through which an electromagnetic field is applied across the gas or plasma. The working of the “Gravity Control Cell” is based on the discovery of the general Principle of Gravity Control, which shows that *any substance* subjected to the action of an oscillating electromagnetic field has its gravitational mass reduced and that the gravity acceleration in any transversal direction to the substance (body) becomes reduced at the same proportion in which the gravitational mass of the body has been reduced. In agreement with this principle, the change in the gravitational mass of the body and in the gravity acceleration in any transversal direction to the body is directly proportional to the product of the electromagnetic energy density applied to the body by the refraction index, and inversely proportional to the mass density of the body. The use of gas or plasma at ultra-low pressure is explained: first, because the gases or the plasmas have low mass density and, second, because the smaller the pressure, also the smaller the mass density of the gas or plasma. With one or more conductor or superconducting inductors with the function of providing the oscillating electromagnetic field, the chamber can contain any type of gas. The type of gas, its pressure and temperature, as well as the form of the chamber depend on the specific objective for which the “Gravity Control Cell” has been projected. In some systems, as in the case of quantum gravitational antennas and aerospatial spacecrafts, the gas or plasma can eventually be substituted by solid matter since, in agreement with the General Principle of Gravity Control, the

effect of gravitational mass reduction occurs in *any substance* subjected to an oscillating electromagnetic field. All the theoretical foundation of the "Gravity Control Cell" can be found in details in the already mentioned articles: a) "Mathematical Foundations of the Relativistic Theory of Quantum Gravity", Copyright ©2007 by Fran Garcia de Aquino Filho, available in: arxiv - physics/0212033; b) "Gravity Control by means of *Electromagnetic Field* through Gas or Plasma at Ultra-Low Pressure**",** Copyright © 2007 by Fran Garcia de Aquino Filho, available in: arxiv – physics /0701091.

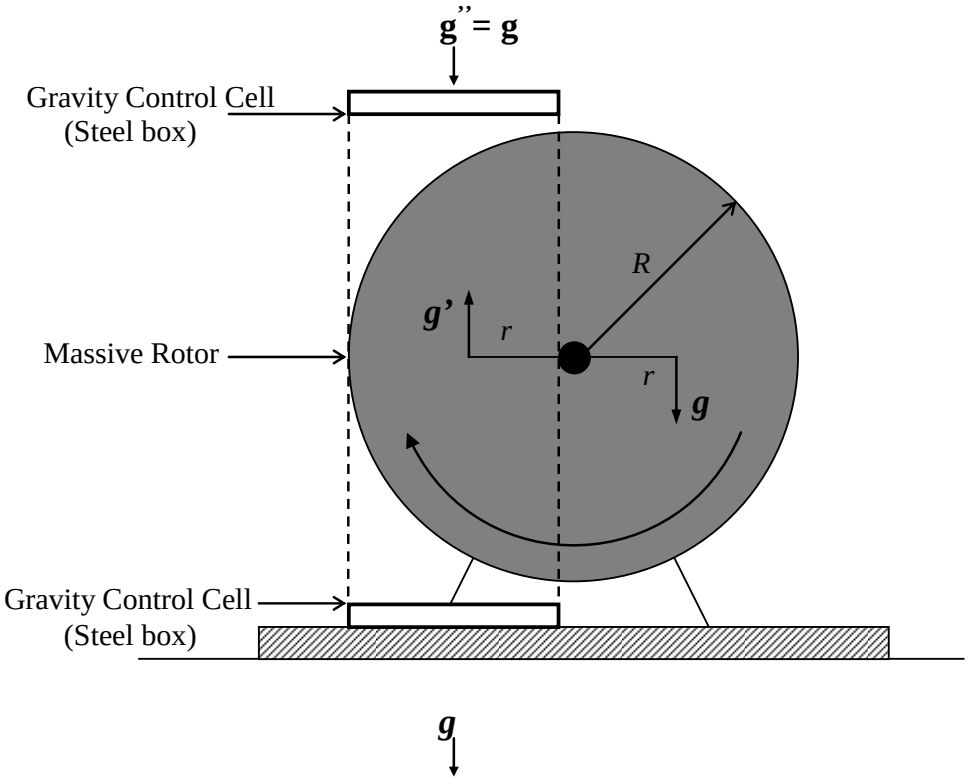


(a)



(b)

Fig. 1 – (a) Gravity Control Cell (GCC) filled with *air* at ultra-low pressure.
(b) Gravity Control Battery (Note that if $\chi_1 = \chi_2^{-1} = -1$ then $g'' = g$)



Note that $g' = (\chi_{steel})^2 \chi_{air} g$ and $g'' = (\chi_{steel})^4 (\chi_{air})^2 g$ therefore for $\chi_{steel} \cong 1$ and $\chi_{air(1)} = \chi^{-1}_{air(2)} = -n$ we get $g' \cong -ng$ and $g'' = g$

Fig. 2 – The Gravitational Motor

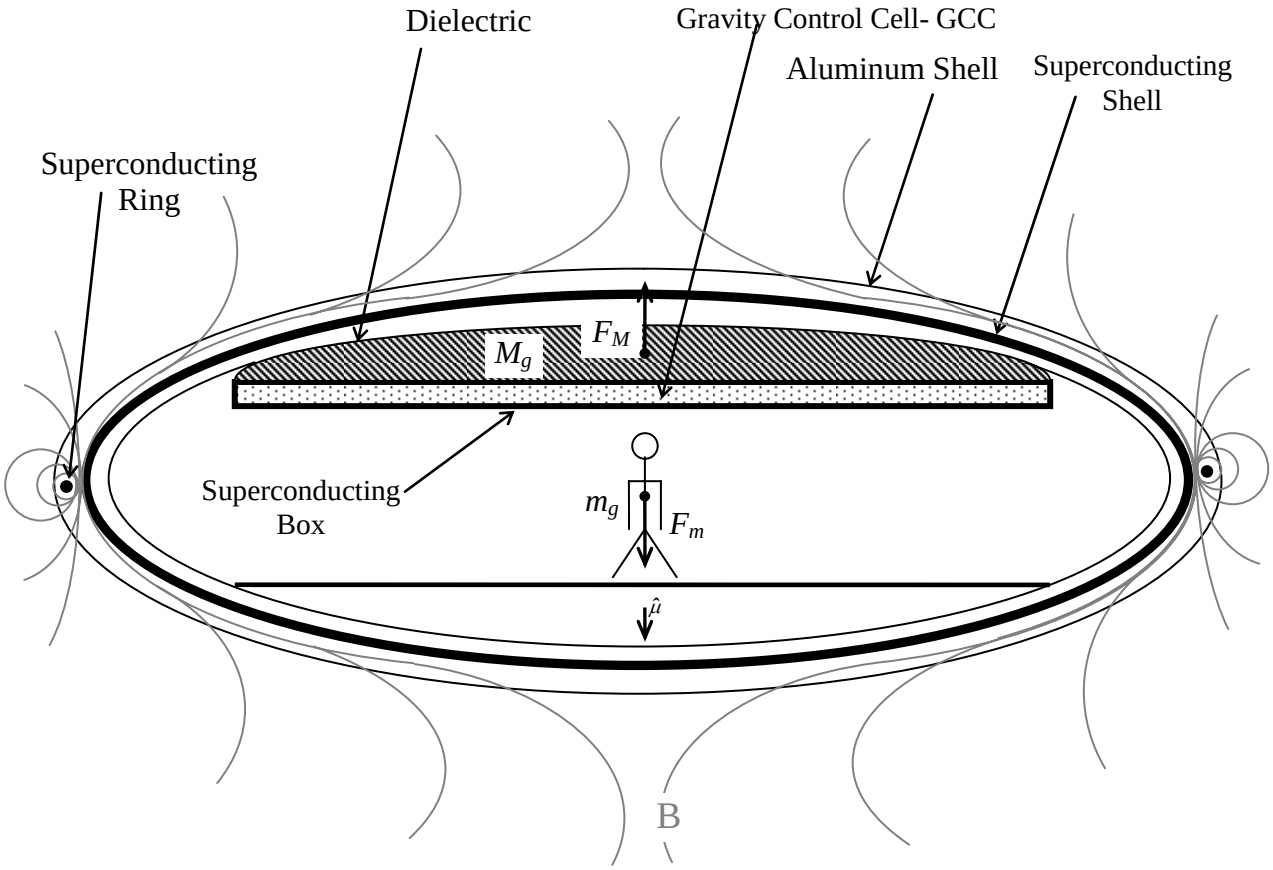


Fig. 3 – The Gravitational Spacecraft – Due to the *Meissner effect*, the magnetic field *B* is expelled from the *superconducting shell*. Similarly, the magnetic field B_{GCC}, of the GCC stay confined inside the *superconducting box*.

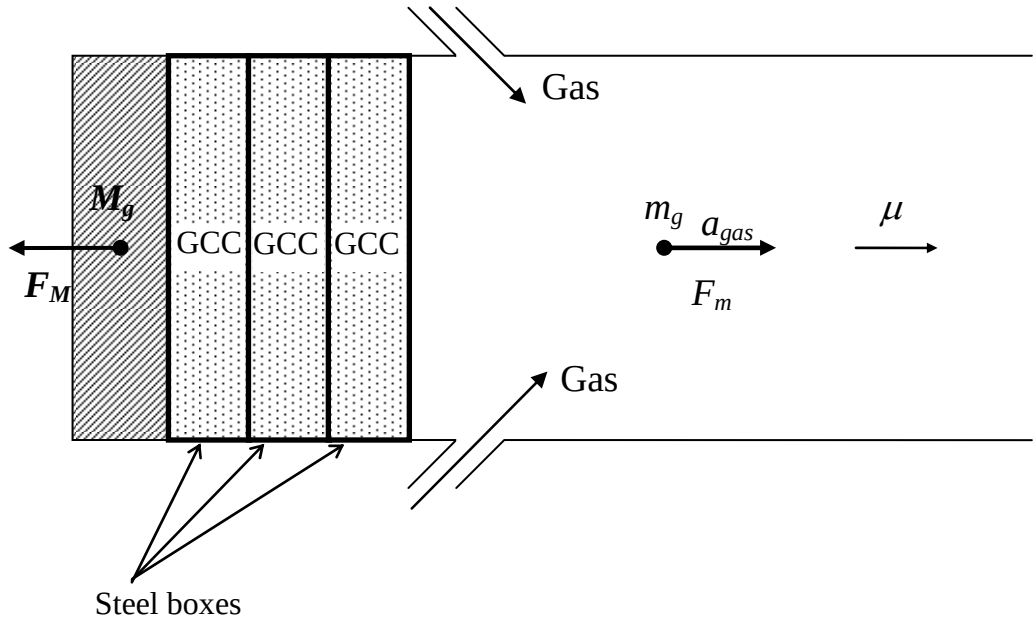


Fig. 4 – The Gravitational Thruster

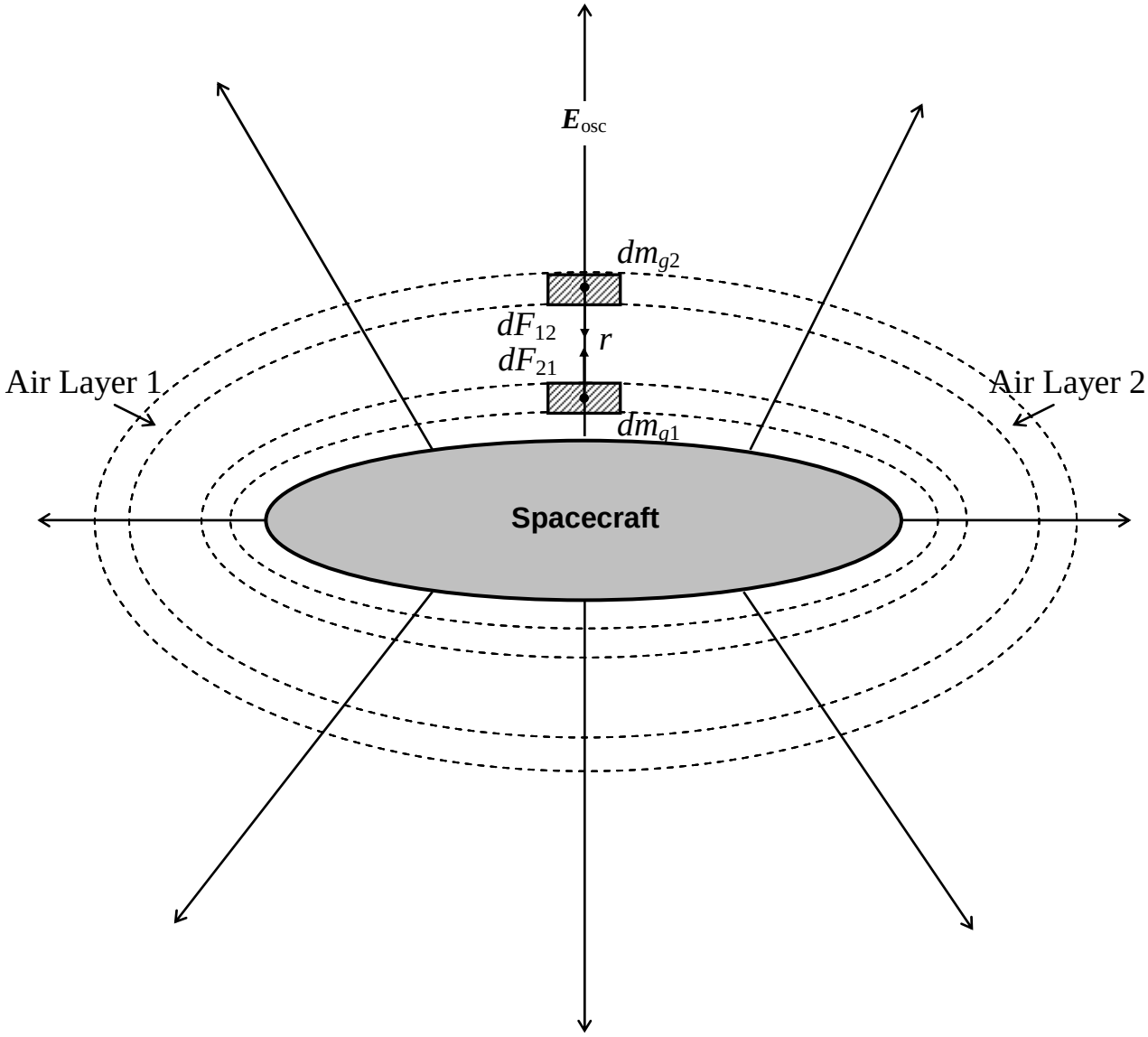


Fig. 5 – Gravitational forces between two layers of the "*air shell*". The electric field $\boldsymbol{E}_{\text{osc}}$ provides the *ionization* of the *air*.

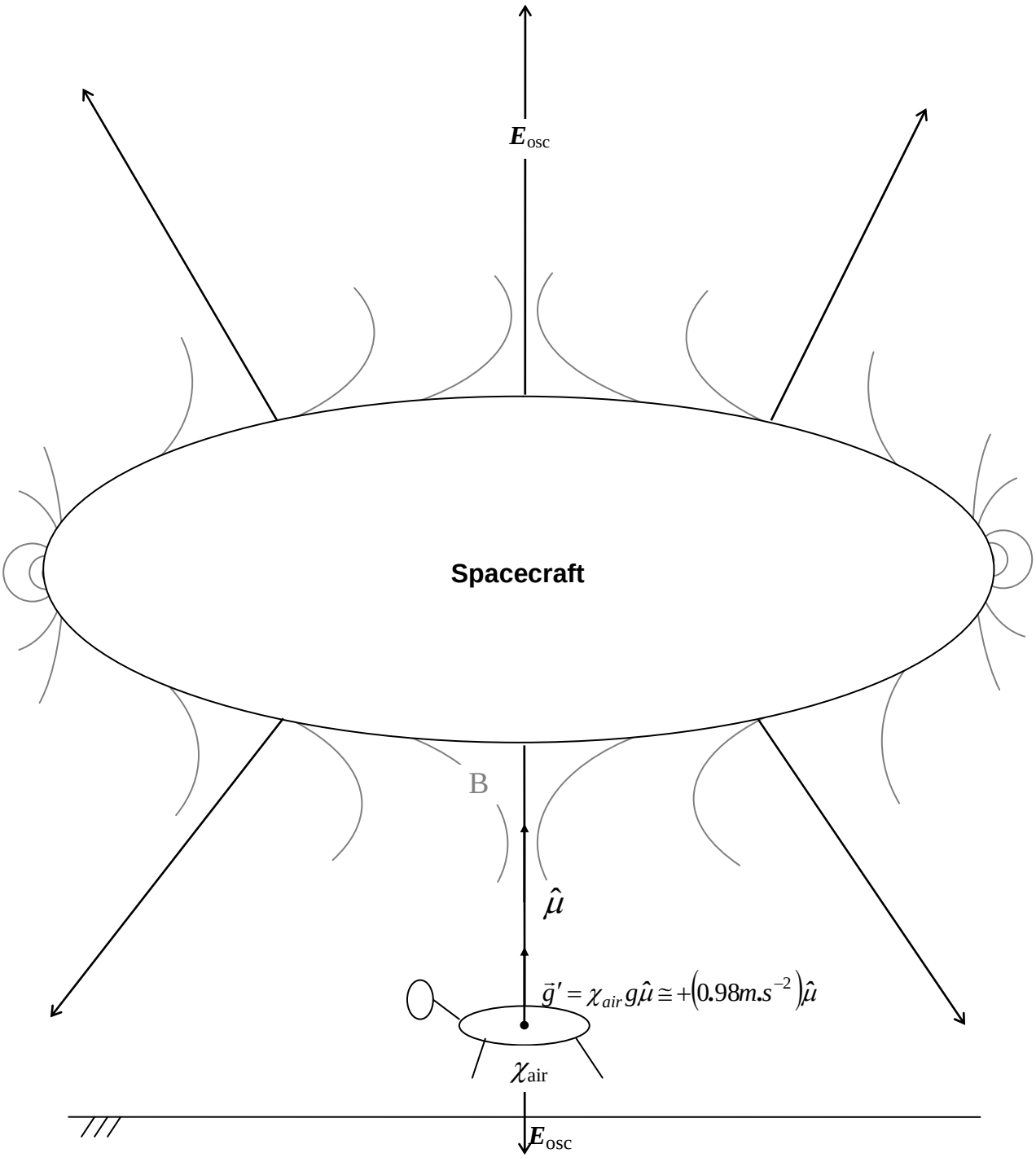


Fig. 6 – The Gravitational Lifter

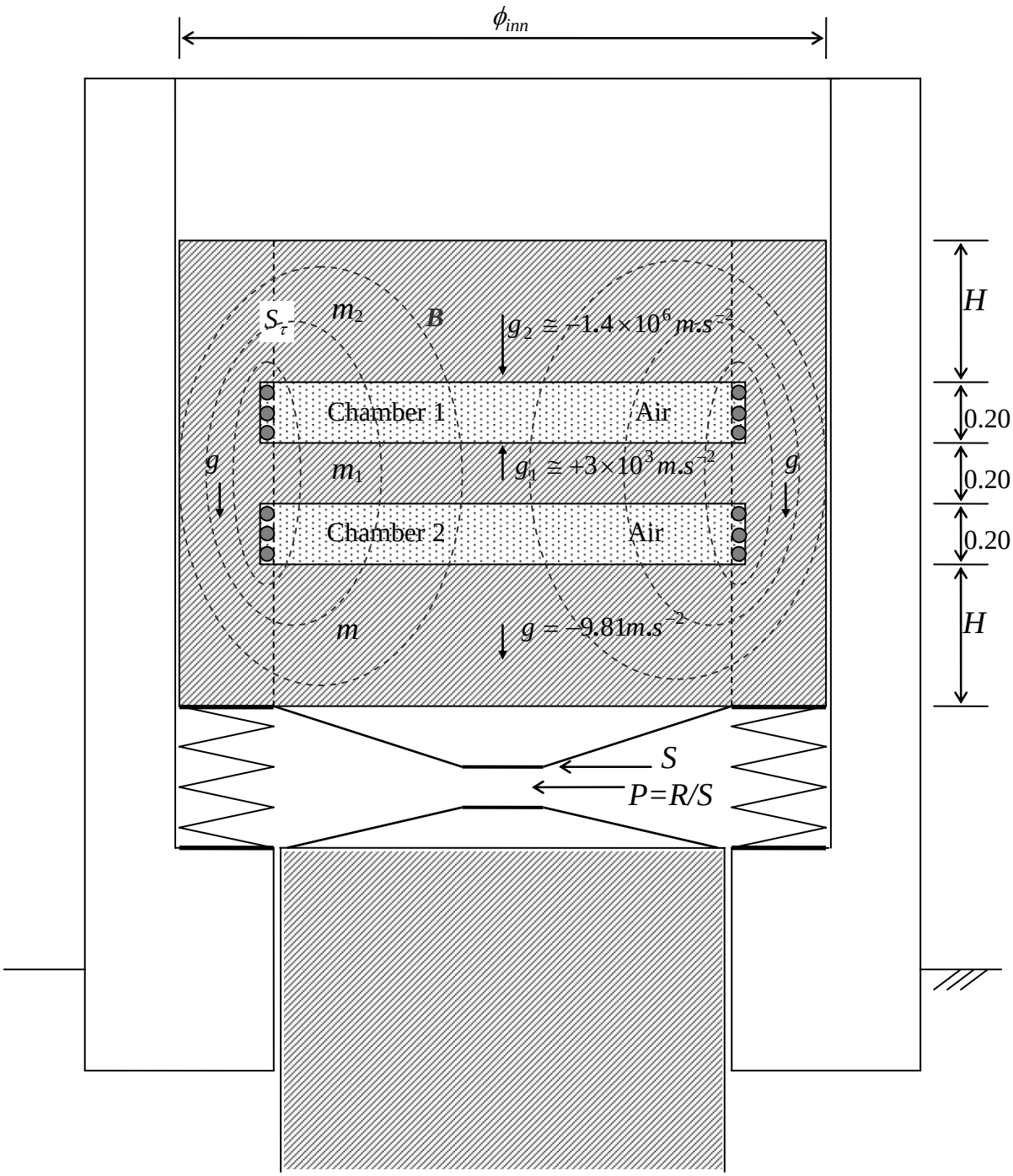
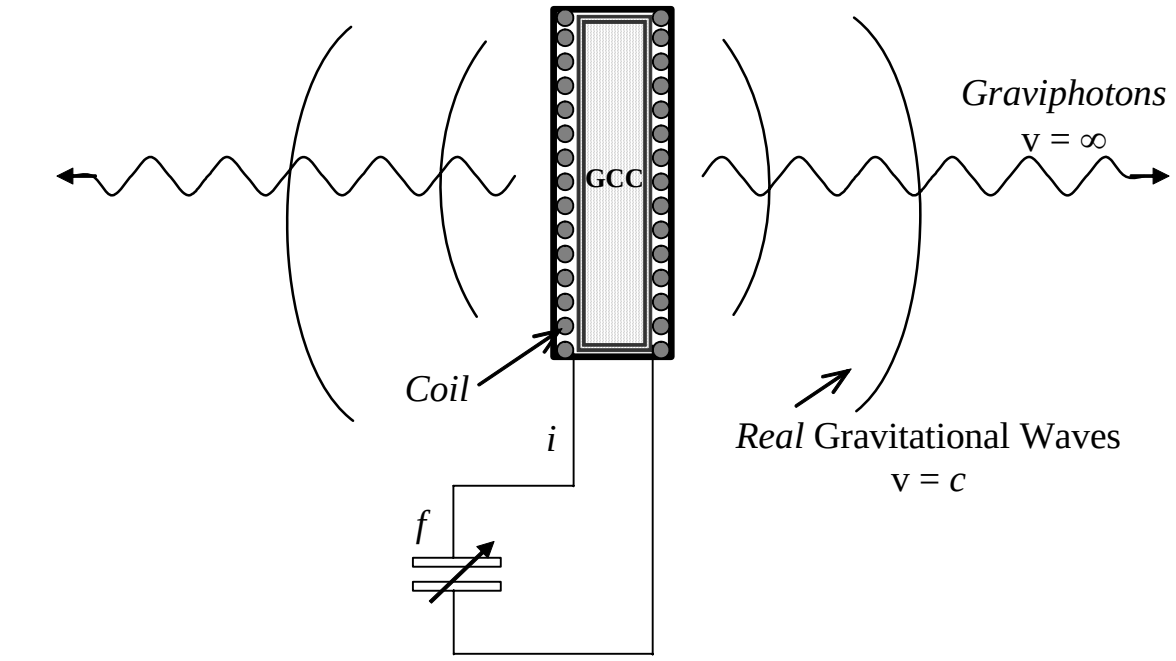
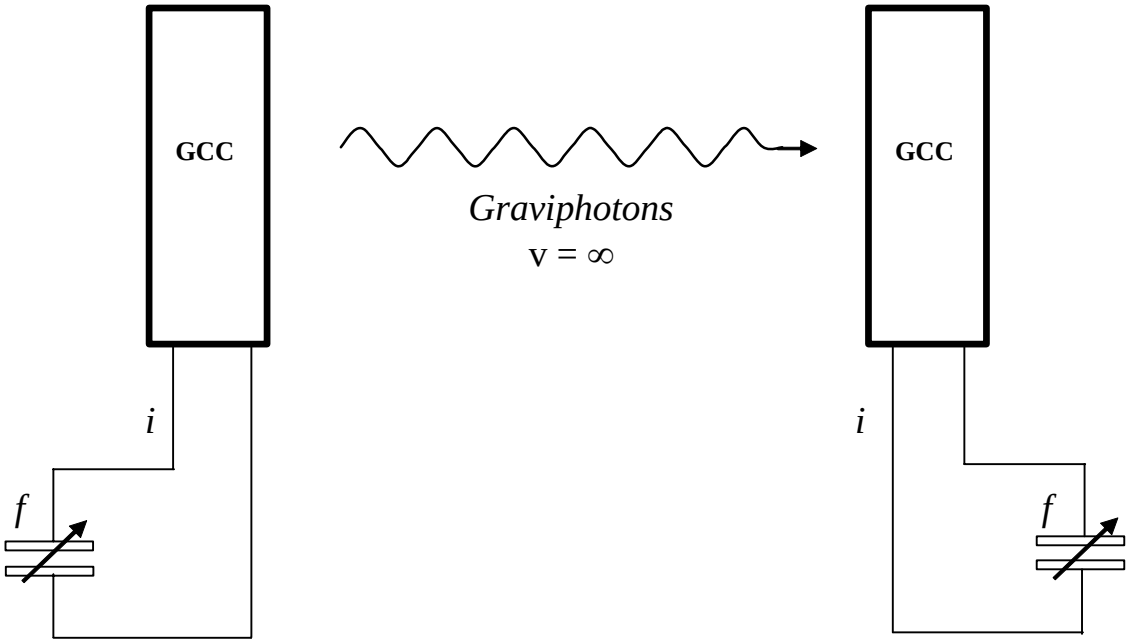


Fig. 7 – *Gravitational Press*

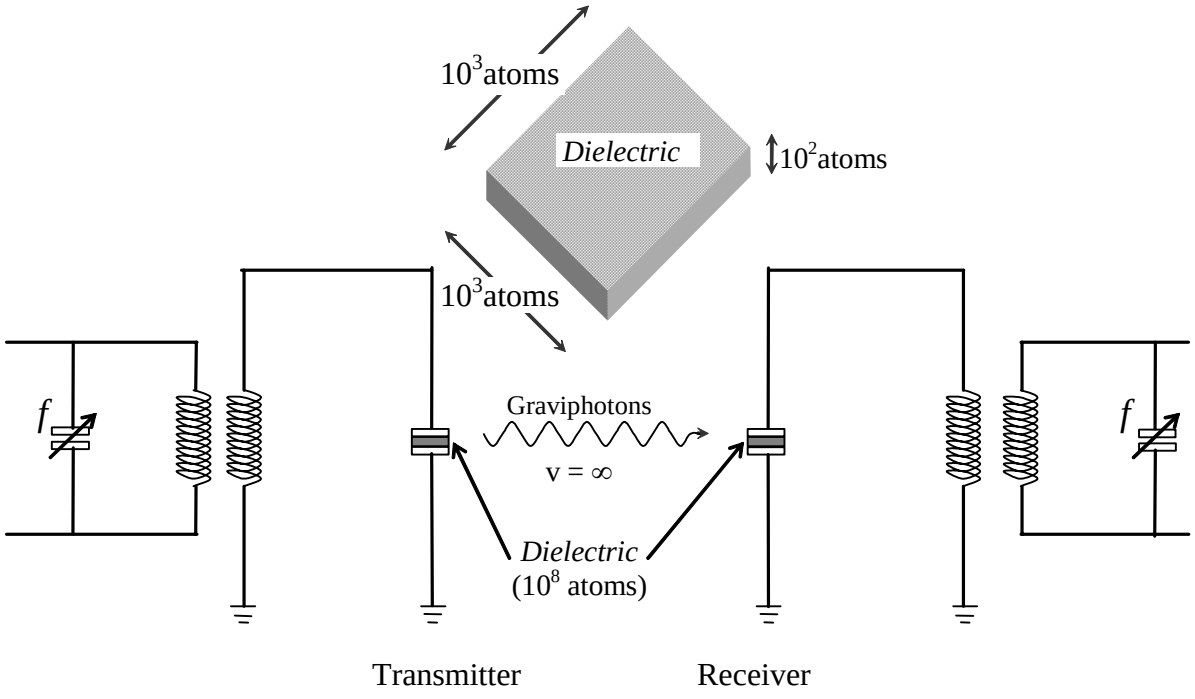


(a) GCC Antenna

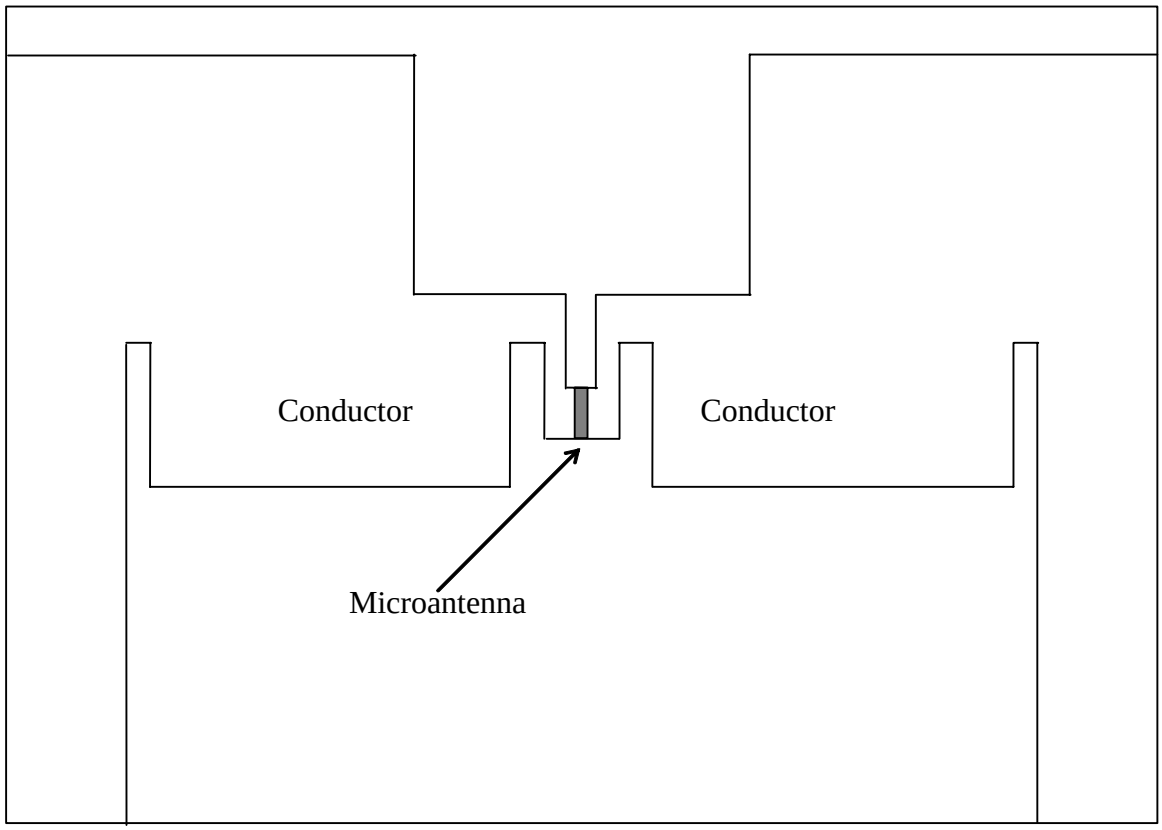


Transmitter (b) Receiver

Fig. 8 - Transmitter and Receiver of *Virtual* Gravitational Radiation.



(a)



(b)

Fig. 9 – Quantum Gravitational Microantenna

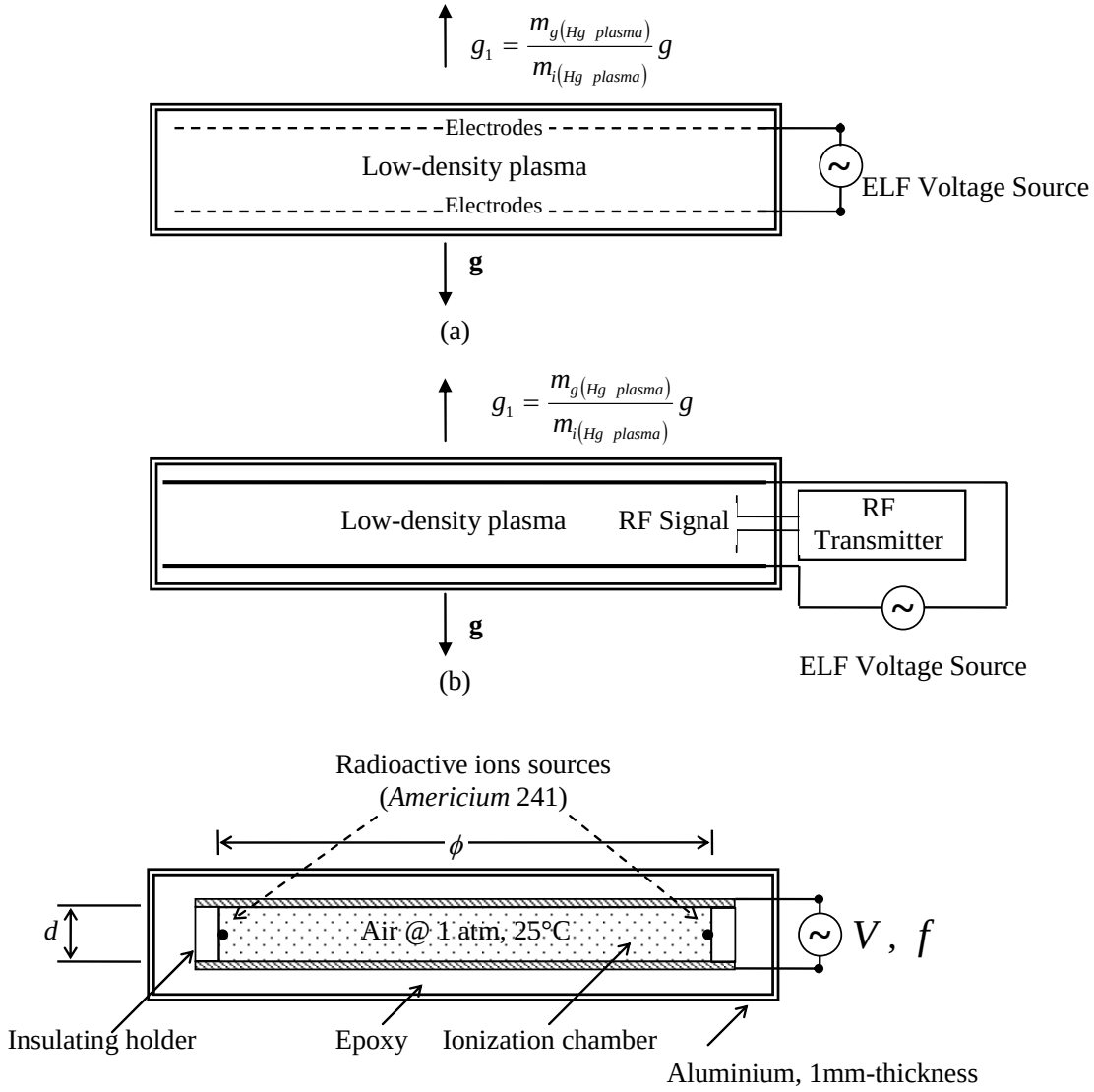


Fig. 10 – *Schematic diagram of Gravity Control Cells (GCCs).*
(a) GCC where the ELF electric field and the ionizing electric field can be the same. (b) GCC where the plasma is ionized by means of a RF signal. (c) GCC filled with *air* (at ambient temperature and 1 atm) strongly ionized by means of alpha particles emitted from radioactive ions sources (Am 241, *half-life* 432 years). Since the electrical conductivity of the ionized air depends on the amount of ions then it can be strongly increased by increasing the amount of Am 241 in the GCC. This GCC has 36 radioactive ions sources each one with 1/5000th of gram of Am 241, conveniently positioned around the ionization chamber, in order to obtain $\sigma_{air} \cong 10^3\, S.m^{-1}$.

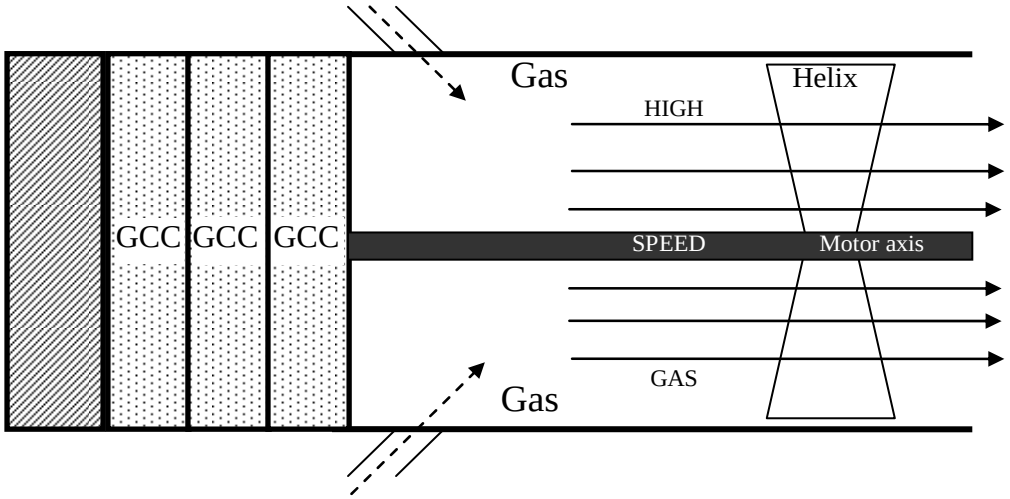


Fig. 11 - The Gravitational Turbo Motor – The gravitationally accelerated gas, by means of the GCCs, propels the helix which movies the motor axis.