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Explanation of dynamical Biefeld-Brown Effect from the standpoint of ZPF field

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ABSTRACT

The research group of the HONDA R&D Institute observed the weigh reduction at the experiment by applying an alternate electric field to the capacitor. This phenomenon, which can be called as "dynamical Biefeld-Brown effect", can not be explained within the framework of the conventional physics. From the standpoint of the ZPF field, the author tries to explain this phenomenon by interactions between the zero-point field of the quantum vacuum and the high potential electric field.

Keywords: Biefeld-Brown effect, zero-point field, high-voltage capacitors, electrogravitics, artificial gravity

INTRODUCTION

H.E.Puthoff proposed in his article[1] that gravity is a form of long-range van der Waals force associated with the Zitterbewegung of elementary particles in response to zero-point fluctuations(ZPF) of the vacuum. Prof. Biefeld and T.T.Brown discovered that a sufficiently charged capacitor with dielectrics exhibited unidirectional thrust in the direction of the positive plate. In recent years, it was also confirmed by the research group of the HONDA R&D Institute that the weigh reduction was observed by applying high intensity electric field to the capacitor. M.B.King gave an idea in his work[2] that electromagnetic fluctuations of the vacuum was the source of the Biefeld-Brown effect, which generates the unidirectional thrust for the dielectric material under high potential electric field. He considered that a slight coherence of vacuum fluctuations due to the high potential electric field caused an alternation of inertial properties of the body with the ionic lattice of a rapidly spinning atom, but its mechanism was not fully explained. Thus the author tries to explain this phenomenon, which can be called as "dynamical Biefeld-Brown effect", from the standpoint of the zero-point fluctuations of the vacuum.

1. HONDA EXPERIMENT BY APPLYING ELECTRIC FIELD TO THE CAPACITOR

From the 1st of Feb. till the 1st of March in 1996, the research group of the HONDA R&D Institute conducted experiments to verify the B-B effect with an improved experimental device in 1996 to reject the influence of corona discharges and electric wind around the capacitor by setting the capacitor in the insulator oil contained within a metallic vessel as shown in Fig.1[3]. The capacitor used at the experiment was a circular plate made of a dielectric glass with the thickness, $t = 1mm$, the diameter, $d = 170mm$ and the weight, $W = 62g$.

They conducted the experiment by applying 8kV AC pulses with the frequency of 50Hz to the capacitor. AC pulses were generated by using the device shown in Fig.2. The circuit diagram for generating AC pulses is shown in Fig.3.

* "The views expressed in this article are of the author and do not reflect the official policy of his position."

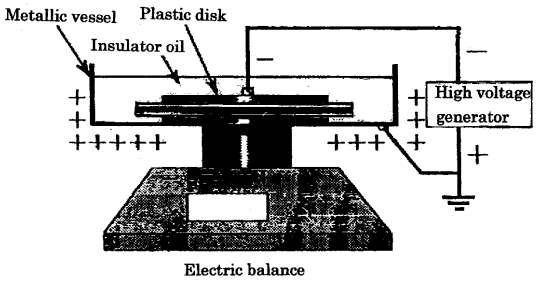

Fig.1 Schematic diagram of the experiment

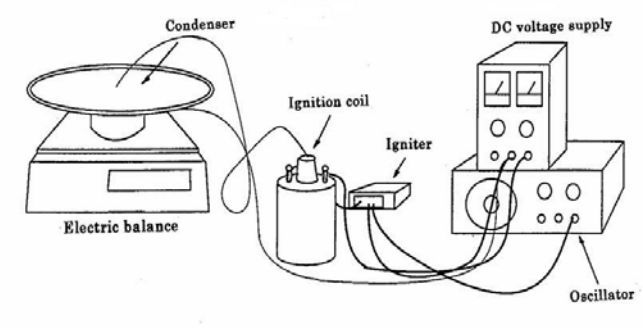

Fig.2 Experimental set-up for the dynamical experiment

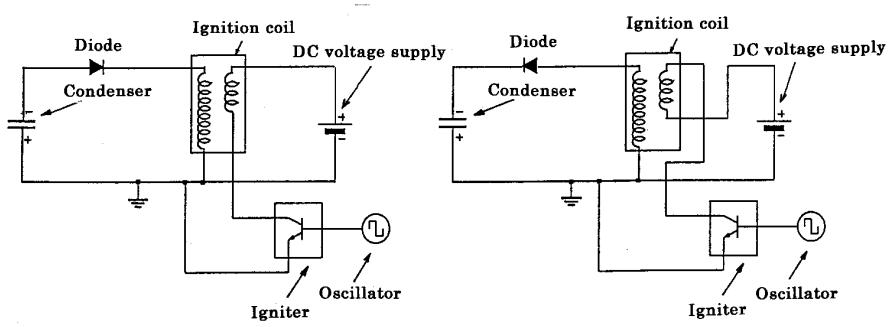

Fig.3 Circuit diagram for generating AC pulses

The experimental results by impressing -8kV and +8kV AC pulses to the capacitor conducted by the HONDA research group are shown in Fig.4 respectively, where the horizontal line is for the number of the experiment and the vertical line is for the weight loss observed.

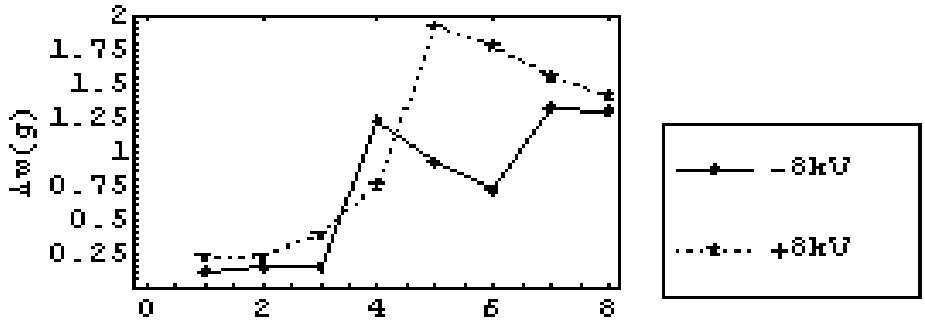

Fig.4 Measured results observed at the experiment

From experimental results, it was found that the case of AC pulses exhibited higher reduction of weight than the case of DC exposures. Maximum weight loss measured at the experiment by applying AC pulses was $\Delta M = 0.9 \pm 0.63\,\mathrm{g}$, which was about 3% of the own weight of the capacitor used at the experiment[3].

Supposing that the weight reduction of the capacitor is responsible for forces generated by the ionic transfer of the momentum, it can be estimated from the equations given by[4]

$$\Delta M = \sqrt{2m_0 V_0 / q} \cdot (i / g_0) \ , \qquad (1)$$

where m_0 is the mass of the carrier of the charge in the medium, q is the charge of the carrier, g_0 is gravity acceleration on the Earth, V_0 is the applied voltage, and i is the current density given by $i = 2\pi f C V_0$ (C :capacity, f :frequency of applied voltage). By introducing experimental values, $C = 1682$ pF, $V_0 = 8$ kV, and $f = 50$ Hz, into Eq.(1), the weight reduction due to ionic winds becomes $\Delta W = 1.3 \times 10^{-3}$ g , which is negligible small compared with the experimental result.

The author obtained the following formula for the electrogravitic force induced on a dielectric material from a weak field approximation of Einstein's General Relativity Theory[5] as

$$E_g \approx -Z\sqrt{4\pi\varepsilon_r \varepsilon_0 G} \cdot E = -8.62 \times 10^{-11} Z \sqrt{\varepsilon_r} \cdot E \ , \qquad (2)$$

where Z is a number of electrons circulating around the atomic nucleus, ε_r is a specific inductive capacity of the dielectric material, ε_0 is a permittivity of free space and G is the gravitational constant. Dr.Boyko Ivanov of the Institute for nuclear Research and Nuclear Energy in Bulgaria also found the similar equation deduced from Weyl Majumdar-Papapetrou solutions of the general relativity theory (see Appendix), which is equivalent (modulo Z) to Eq.(2). By introducing $\varepsilon_r = 10$ and $E = 8 \times 10^6$ (V/m) into Eq.(2), the maximum mass reduction ΔM of the capacitor by the impressed electric field can be estimated as

$$\Delta M = 8.62 \times 10^{-11} Z \sqrt{\varepsilon_r} EW / g_0 = 0.002(g), \qquad (3)$$

where g_0 is the gravitational acceleration on the Earth.

As the weight loss estimated by Eq.(2) is also much smaller than observed results for the dynamical experiment, it is considered that the dynamical B-B effect observed by the HONDA research group might be attributed to another mechanism other than the ion transfer of momentum or electrogravitic force generated by high potential electric field.

2. MASS SHIFT BY THE EXTERNAL ELECTROMAGNETIC FIELD

B.Haish, A.Rueda and H.E.Puthoff suggested that if one could somehow modify the vacuum medium then the mass of a particle or object in it would change according to the zero-point field theory[6]. Under an intense electromagnetic field, it has been theoretically predicted that electron experiences an increase of its rest mass.

Let H_A be the electrodynamic Hamiltonian of the particle under high electromagnetic field, the following formula was analogically discovered by Dr. P.Milonni [7] shown as

$$H_A = \frac{e^2}{2m_0 c^2} < A^2 > \ , \qquad (4)$$

where m_0 is the rest mass of the elementary particle, e is its charge, c is the light speed and A is the vector magnetic potential field. The similar equation by using terms of the ZPF field was also derived by Haish, Rueda and Puthoff [7] shown as

$$H'_A = \frac{e^2 \hbar}{2\pi m_0 c^3} \omega_c^2 \ , \qquad (5)$$

where $\hbar$ is a Plank constant divided by 2π and ω_c is a cutoff frequency of ZPF spectrum in the vacuum.

From the assumption that $H_A = \Delta H'_A$, we obtain the formula given by

$$\Delta\omega = -\frac{\pi\ c}{2\hbar\omega_0} < A^2 > , \tag{6}$$

where $\omega_c = \omega_0 - \Delta\omega$.

According to the gravitational theory by Haish, Rueda and Puthoff [7], the mass of the elementary particle induced by electromagnetic zero-point fluctuations of the vacuum can be given by

$$m = \frac{\Gamma\hbar\omega_c^2}{2\pi\ c^2} \ , \tag{7}$$

where Γ is the radiation reaction damping constant which defines the interaction of charged elementary particles (point-mass sub-particles called partons) with electromagnetic radiation field.

From Eq.(7), we have

$$\Delta m / m = -2\Delta\omega / \omega_0 = \frac{\pi c}{\hbar\omega_0^2} < A^2 > \ , \tag{8}$$

where ω_0 is the Plank frequency given by $\omega_0 = \sqrt{c^5 / \hbar G} \approx 3\times 10^{43}$ Hz.

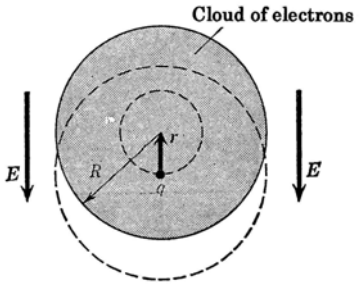

Fig.5 Dipole field generated by the electric field

The vector potential field for the dipole field generated by the variance of electric charge shown in Fig.5 becomes[8]

$$A = \frac{1}{4\pi\varepsilon_0 c^2}\frac{\dot{p}(t - r/c)}{r} = \frac{1}{4\pi\varepsilon_0 c^2}\frac{\omega N e d(t)}{r} \ , \tag{9}$$

where N is a number density of electric charge and $d(t)$ is a displacement of the charge given by

$$d(t) = \frac{Ne}{m}\frac{E_0}{\omega_e^2 - \omega^2}\cos\omega(t - r/c) \ . \tag{10}$$

In Eq.(10), ω_e is a resonant angular frequency given by $\omega_e = \sqrt{Ze^2 / \alpha_e m}$ (α_e: electron polarizability), which becomes about $10^{15} \sim 10^{16}$ Hz.

From above equations, we have

$$\Delta M(\omega) / M = \frac{\pi G}{c^4}\int < A^2 > dv = -\frac{N^2 e^4 G R}{4\varepsilon_0^2 m^2 c^8}\frac{\omega^2}{(\omega_e^2 - \omega^2)^2 + \eta^2\omega^4}E_0^2 \ , \tag{11}$$

where R is a radius of the electron cloud and η is the damping factor.

If $\omega_2 - \omega_1$ is large compared to the width of the resonance frequency, we have

$$\int_{\omega_1}^{\omega_2}\frac{\omega^2 d\omega}{(\omega_e^2 - \omega^2)^2 + \eta^2\omega^4} \approx \frac{\pi}{2\eta\omega_e} \ . \tag{12}$$

Then the charged particle experiences an alternation of its rest mass under the impulsive electromagnetic field given by

$$\Delta M / M = -\frac{\pi}{8}\frac{e^4 G}{\varepsilon_0^2 m^2 c^8}\frac{N^2 R}{\eta\omega_e}E_0^2 . \qquad (13)$$

From this equation, new factors to induce a weight loss of the capacitor are presented as follows:

- Increase the AC voltage impressed to the capacitor, nonlinear increase of the weight loss is produced.
- Increase the charge density of electric current flowing through the capacitor, the greater the weight loss

From which, it can be considered that the electric discharge between plates, which has a wide range of spectrum, produces a great weight loss of the capacitor as observed by the HONDA research group at the experiment.

3. POSSIBILITY TO PRODUCE ARTIFICAIAL GRAVITY BY ELECTROMAGNETIC FIELD

Assuming that $\eta = \Gamma = 2e^2 / 3mc^2$, which is the Abraham-Lorentz damping constant[7], Eq.(13) becomes

$$\Delta M / M = -3.23\times 10^{-13} R\frac{V^2}{t^2} , \qquad (14)$$

where t is the separation of the plate and V is the applied voltage.

By introducing values, $V = 8\,\mathrm{kV}$, t=1mm and R=1mm for the experiment, and $N = 10^{24}$, $\omega_e = 6\times 10^{13}$ for the value of dense hot plasma[9], into Eq.(14), we have $\Delta M = 1.28g$, which is close to the experimental values obtained by the Honda research group. Hence it is considered that the variance of weight loss observed at the experiment might be attributed to the external electric field and the manipulation of inertia of the moving body may be possible by applying AC pulses to the capacitor.

From the momentum equation given by

$$\frac{dP}{d\tau} = \frac{d(Mv)}{d\tau} = v\frac{dM}{d\tau} + M\alpha , \qquad (15)$$

the acceleration induced for the moving body becomes

$$\alpha = -\frac{v}{\Delta\tau}\frac{\Delta M}{M} = 3.23\times 10^{-13}\frac{R\cdot v}{\Delta\tau}\frac{V^2}{t^2} , \qquad (16)$$

according to the conservation of momentum. This equation suggests that high AC voltage pulses impressed to the capacitor composed of dielectric material may affect the inertia of the mass and it would produce a rapid acceleration without stress for the disc structure shown in Fig.6 with densely charged plasma cloud.

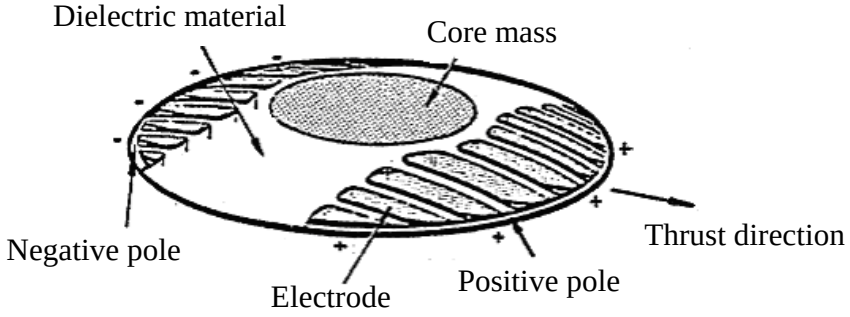

Fig.6 Electrogravitic craft by T.T.Brown

CONCLUSIONS

From the theoretical analysis by the zero-point field theory, it is considered that the origin of the dynamical Biefeld-Brown effect might be attributed to the interaction of zero-point vacuum fluctuations with high potential

electric field impressed to the capacitor. This result suggests that the pulsed electric field applied to the capacitor may produce artificial gravity sufficient for practical application to the space propulsion technology.

Appendix:

Dr. Boyko Ivanov wrote papers to show that Weyl-Majumdar-Papapetrou solutions of the general relativity theory include the equation for the gravitational field induced by static electric field given by[10]

$$g = c^2 f^{-1}\left(\frac{B'}{2}\sqrt{\frac{\kappa\varepsilon}{8\pi}}\overline{\phi_i} + \frac{\kappa\varepsilon}{8\pi}\overline{\phi}\,\overline{\phi_i}\right), \qquad \text{(A1)}$$

where $f \equiv g_{00}$, B' is a constant and $\kappa = 8\pi G / c^4$.

From which, he derived the formula of gravitational force F_g shown as[10]

$$F_g = \sqrt{G\varepsilon}\,\frac{M}{d}\overline{\psi}_2 = \sqrt{G\varepsilon}\,\mu S\overline{\psi}_2\,, \qquad \text{(A2)}$$

where M is the mass of the dielectric, μ is its mass density, ε is dielectric constant, d is the distance between the plates, ψ_2 is the potential of the second plate when $\psi_1 = 0$ and S is an area of the plate. This is equivalent (modulo Z) to the formula of the force generated by high potential electric field given by T.Musha [5] shown as

$$F \approx 8.62\times10^{-11} Z\mu_0 S\sqrt{\varepsilon_r}V / t\,, \qquad \text{(A3)}$$

where μ_0 is a total mass of the dielectric per unit area, ε_r is the specific inductive capacity of the dielectric, V is the impressed voltage to the capacitor and t is its thickness. Those equations are the same except for the modulo Z , which was found by Dr.Ivanov when he passed the numeric coefficient by CGS system to SI system[11], where Dr.Ivanov works in the CGS (Gauss) system of units, while Musha works in the international system SI.

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