Possibility of controlled nuclear fusion by means of Gravity Control

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The gravity control process described in the articles *Mathematical Foundations of the Relativistic Theory of Quantum Gravity* [1] and *Gravity Control by means of Electromagnetic Field through Gas at Ultra-Low Pressure*, [2] points to the possibility of obtaining *Controlled Nuclear Fusion* by means of increasing of the intensity of the gravitational interaction between the nuclei. When the gravitational forces $F_G = Gm_g m'_g / r^2$ become greater than the electrical forces $F_E = qq'/4\pi\varepsilon_0 r^2$ between the nuclei, then nuclear fusion reactions can occur.

The equation of correlation between gravitational mass and inertial mass [1]

$$\chi = \frac{m_g}{m_i} = \left\{1 - 2\left[\sqrt{1 + \frac{\mu}{4c^2}\left(\frac{\sigma}{4\pi f}\right)^3 \frac{E^4}{\rho^2}} - 1\right]\right\} \qquad (1)$$

tells us that the gravitational mass can be strongly increased. Thus, if $E = E_m \sin \omega t$, then the average value for E^2 is equal to $\frac{1}{2}E_m^2$, because E varies sinusoidaly (E_m is the maximum value for E). On the other hand, $E_{rms} = E_m/\sqrt{2}$. Consequently, we can replace E^4 for E_{rms}^4. In addition, as $j = \sigma E$ (*Ohm's vectorial Law*), then Eq. (1) can be rewritten as follows

$$\chi = \frac{m_g}{m_{i0}} = \left\{1 - 2\left[\sqrt{1 + K\frac{\mu_r j_{rms}^4}{\sigma \rho^2 f^3}} - 1\right]\right\} \qquad (2)$$

where $K = 1.758 \times 10^{-27}$ and $j_{rms} = j/\sqrt{2}$.

Thus, the gravitational force equation can be expressed by

$$F_G = Gm_g m'_g / r^2 = \chi^2 Gm_{i0} m'_{i0} / r^2 =$$
$$= \left\{1 - 2\left[\sqrt{1 + K\frac{\mu_r j_{rms}^4}{\sigma \rho^2 f^3}} - 1\right]\right\}^2 Gm_{i0} m'_{i0} / r^2 \qquad (3)$$

In order to obtain $F_G > F_E$ we must have

$$\left\{1 - 2\left[\sqrt{1 + K\frac{\mu_r j_{rms}^4}{\sigma \rho^2 f^3}} - 1\right]\right\} > \sqrt{\frac{qq'/4\pi\varepsilon_0}{Gm_{i0} m'_{i0}}} \qquad (4)$$

The *carbon fusion* is a set of nuclear fusion reactions that take place in massive stars (at least $8M_{sun}$ at birth). It requires high temperatures ($> 5 \times 10^8 K$) and densities ($> 3 \times 10^9\, kg.m^{-3}$). The principal reactions are:

$$^{12}\mathrm{C} + {}^{12}\mathrm{C} \rightarrow \begin{cases} ^{23}\mathrm{Na} + \mathrm{p} + 2.24\ \mathrm{MeV} \\ ^{20}\mathrm{Ne} + \alpha + 4.62\ \mathrm{MeV} \\ ^{24}\mathrm{Mg} + \gamma + 13.93\ \mathrm{MeV} \end{cases}$$

In the case of Carbon nuclei (^{12}C) of a *thin carbon wire* (carbon fiber) ($\sigma \cong 4 \times 10^4 S.m^{-1}$; $\rho = 2.2 \times 10^3 S.m^{-1}$) Eq. (4) becomes

$$\left\{1 - 2\left[\sqrt{1 + 9.08 \times 10^{-39} \frac{j_{rms}^4}{f^3}} - 1\right]\right\} > \sqrt{\frac{e^2}{16\pi\varepsilon_0 Gm_p^2}}$$

whence we conclude that the condition for the ^{12}C + ^{12}C fusion reactions occur is

$$j_{rms} > 1.7\times10^{18} f^{\frac{3}{4}} \qquad (5)$$

If the electric current through the carbon wire has Extremely-Low Frequency (ELF), for example, if $f = 1\mu Hz$, then the current density, j_{rms}, must have the following value:

$$j_{rms} > 5.4\times10^{13} Am^{-2} \qquad (6)$$

Since $j_{rms} = i_{rms}/S$ where $S = \pi\phi^2/4$ is the area of the cross section of the wire, we can conclude that, for an *ultra-thin carbon* wire with $10\mu m$-diameter, it is necessary that the current through the wire, i_{rms}, have the following intensity

$$i_{rms} > 4.24\ kA$$

Obviously, this current will *explode* the carbon wire. However, this explosion becomes negligible in comparison with the very strong *gravitational implosion*, which occurs simultaneously due to the enormous increase in intensities of the gravitational forces among the carbon nuclei produced by means of the ELF current through the carbon wire as predicted by Eq. (3). Since, in this case, the gravitational forces among the carbon nuclei become greater than the repulsive electric forces among them the result is the production of ^{12}C + ^{12}C fusion reactions.

Similar reactions can occur by using a *lithium* wire. In addition, it is important to note that j_{rms} is directly proportional to $f^{\frac{3}{4}}$ (Eq.5). Thus, for example, if $f = 10^{-8} Hz$, the current necessary to produce the fusion reactions will be $i_{rms} = 130A$. However, it seems that in practice is better to reduce the diameter of the wire. For a diameter of $1\mu m$ $(10^{-6} m)$, the intensity of the current must have the following value

$$i_{rms} > 42.4\,A$$

In order to obtain an ELF current with these characteristics $\left(f = 10^{-6} Hz; i_{rms} = 42.4A\right)$ we can start from the following background: Consider an electric current I, which is the sum of a sinusoidal current $i_{osc} = i_0 \sin\omega t$ [1] and the DC current I_{DC}, i.e., $I = I_{DC} + i_0 \sin\omega t \quad ; \omega = 2\pi f$. If $i_0 << I_{DC}$ then $I \cong I_{DC}$. Thus, the current I varies with the frequency f, but the variation of its intensity is quite small in comparison with I_{DC}, i.e., I will be practically constant (Fig. 1). Thus, we obtain $i_{rms} \cong I_{DC}$ (See Fig.2).

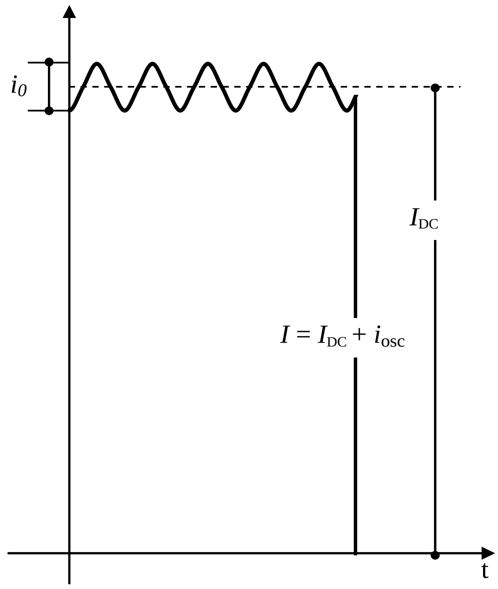

Fig. 1 - The electric current I varies with frequency f. But the variation of I is quite small in comparison with I_{DC} due to $i_o << I_{DC}$. In this way, we can consider $I \cong I_{DC}$.

[1] In order to generate the ELF electric current i_{osc} with $f = 10^{-6} Hz$, we can use the widely-known Function Generator HP3325A (Op.002 High Voltage Output) that can generate sinusoidal voltages with *extremely-low* frequencies down to $f = 1\times10^{-6} Hz$ and amplitude up to 20V ($40V_{pp}$ into 500Ω load). The maximum output current is $0.08A_{pp}$; output impedance $<2\Omega$ at ELF .

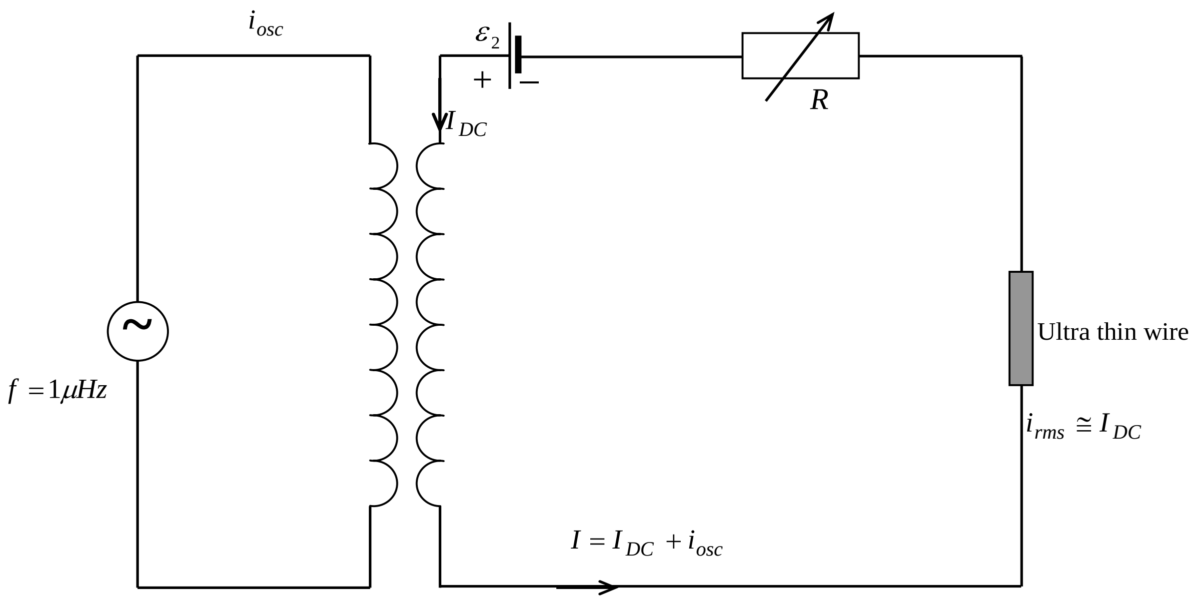

Fig. 2 – Electrical Circuit

REFERENCES

[1] DeAquino, F. (2002). *Mathematical Foundations of the Relativistic Theory of Quantum Gravity*. Physics/0212033.

[2] De Aquino, F. (2007) *Gravity Control by means of Electromagnetic Field through Gas at Ultra-Low Pressure*. Physics/0701091.