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## Electromagnetic plasma reactor: Implicit application of field torsion II

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**Abstract**

In a before work were considered the field torsion as a geometrical invariant necessary to determine the shape required of the electromagnetic plasma to be included in a torus enclosure of cylindrical section where using magnets of certain magnetic special material) and using a current control, is obtained the guided movement of electromagnetic plasma inside the torus with the velocity predicted in the before study due curvature energy. Likewise, is established the reactor prototype functioning and the possibility of identify the derived products of the electromagnetic plasma, as are phonons, fermions, ions, free electrons and protons, magnetic and electric drifts to be used in secondary systems of the reactor and of a possible flight ship.

**Keywords:** Curvature energy, electric drifts, electromagnetic plasma, fermions, ions, magnetic drifts, torsion energy, phonons, reactor.

**Introduction**

Due a several studies of torsion and the conjecture 3. 1, in <sup>[1]</sup>, was considered as fundamental geometrical invariant related with the rotations to generate anti-gravity, the following theorem:

**Theorem (F. Bulnes) 1. 1** The vorticity  $\Omega_H = \text{rot } v$ , involves a torsion in the space  $SO(2, C)C(p)$ , whose nature is magnetic. The circles are formed as freeze fields". Proof. <sup>[1]</sup>.  
□ Here arises the torsion as entity of field or field observable natural to the magnetic field required to direct the current lines of the proper electromagnetic plasma. Likewise, the torsion is evidenced in the magnetic field used on the current that circulates as circular ring. Then considering the plasma linearized movement equation <sup>[2, 3]</sup>:

$$\rho_m \frac{dv}{dt} = \mathbf{j} \times \mathbf{B} - \nabla P - \rho_m \nabla \phi, \quad (1)$$

we can characterize the electromagnetic plasma as fluid  $\approx II_H(\sigma, E)$ , then the equation (1) takes the form:

$$m \frac{dv}{dt} = m\mathbf{g} + q \left( \mathbf{E} + \frac{1}{c} \mathbf{v} \times \mathbf{H} \right), \quad (2)$$

where finally, nulling the electric and gravitational fields while the magnetic field is constant in the space and the time (this in the practice is done with Neodymium magnets around the plasma torus and these arranged along the torus at a minimum distance from each other (see the figure 1)), we have:

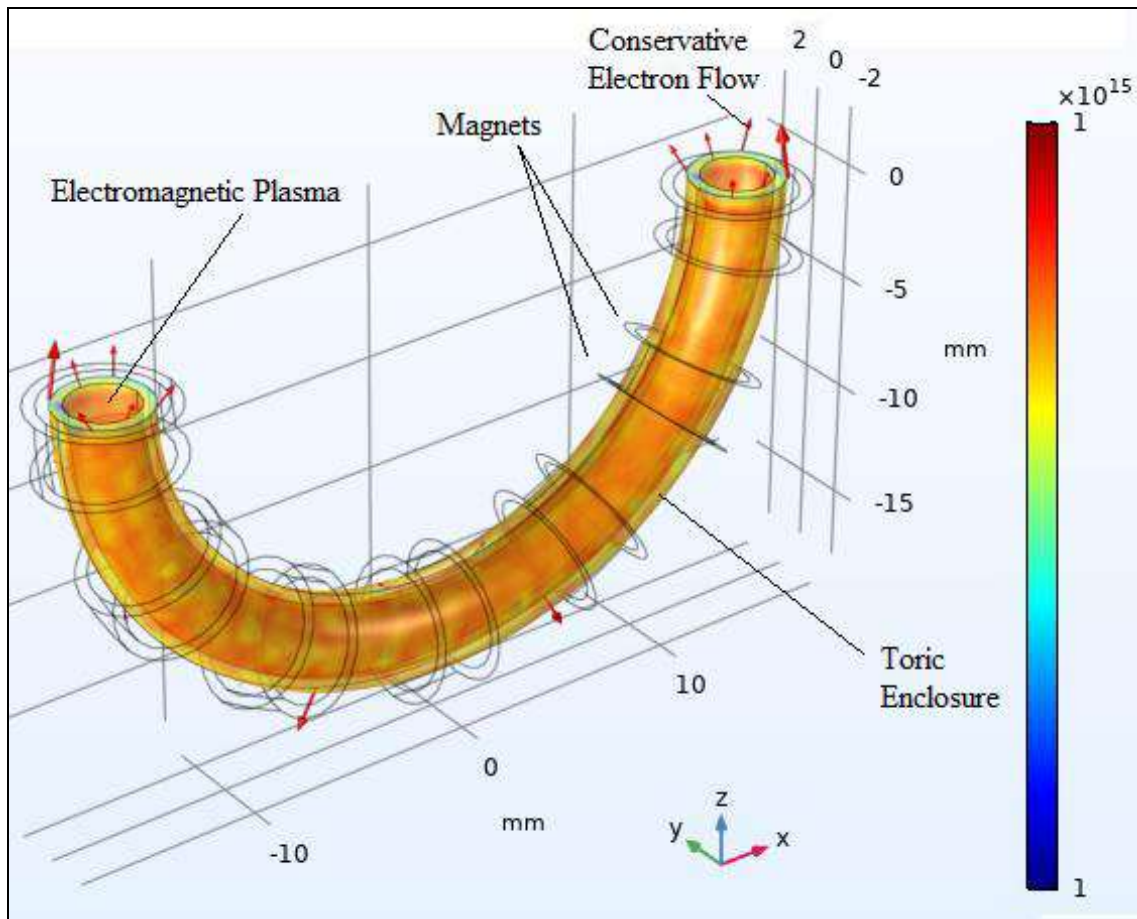


Fig 1: Simulation in Comsol showing the provision of the magnets along of the semicircular torus section (see the figure 1, in [ijem]).

By the theorem 4. 1, in [1], we are searching a control of the electromagnetic field whose principal contribution is given by the magnetic field that hold plasma captive inside the enclosure and will give shape of the infinitum cycle of plasma. Then the way to can control the electromagnetic plasma will be through curvature energy dossed and modulated by its spectra:

$$\kappa(\omega) = \frac{q}{mc} \int_{-\infty}^{+\infty} H(r)e^{-j\omega r} dr, \tag{3}$$

where

$$H(r) = p \left( \frac{r}{l} \right) \frac{H}{l^2} = V_0 \frac{H}{l^2}, \tag{4}$$

Where the pulse is given in voltage and  $l$ , is a distance which could correspond to a cycle of the cylindrical spiral in the drifting process inside the plasma.

The contribution by the magnetic field is the major contribution to the curvature energy, as has been mentioned. This is not simple coincidence, since on the one hand the torsion is a curvature, of fact is a second curvature and for other hand by the conjecture 3. 1, the nature of the torsion is magnetic. Then magnetic components in the reactor will establish the control and modulation of the electromagnetic plasma.

Another important item are the derived products obtained from the electromagnetic plasma as are the different mode drifts, free electrons, fermions and phonons, which can be used in auxiliary propulsion systems and fed the control systems and navigation of a flight ship.

#### Curvature Energy in the Control of the Electromagnetic Plasma

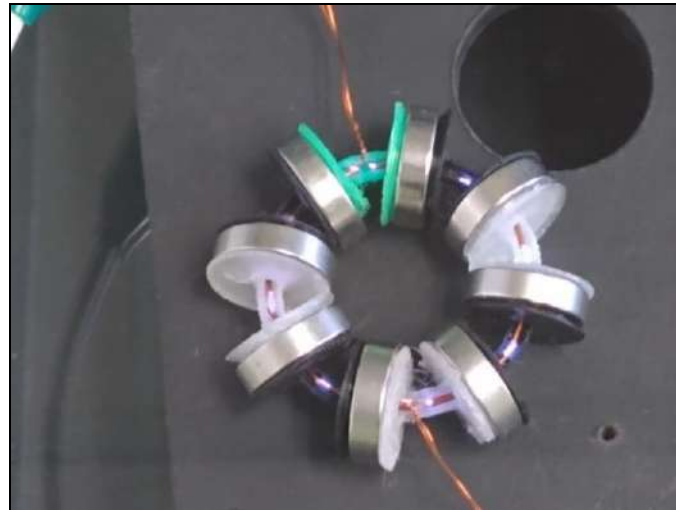
We require that the electromagnetic plasma advances in a direction depending the polarity. This advance must be a plasma torus inside the torus enclosure, closing the complete cycle.

However the movement of the plasma will be given for the displacement velocity in any point or particle of the plasma given by the velocity field:

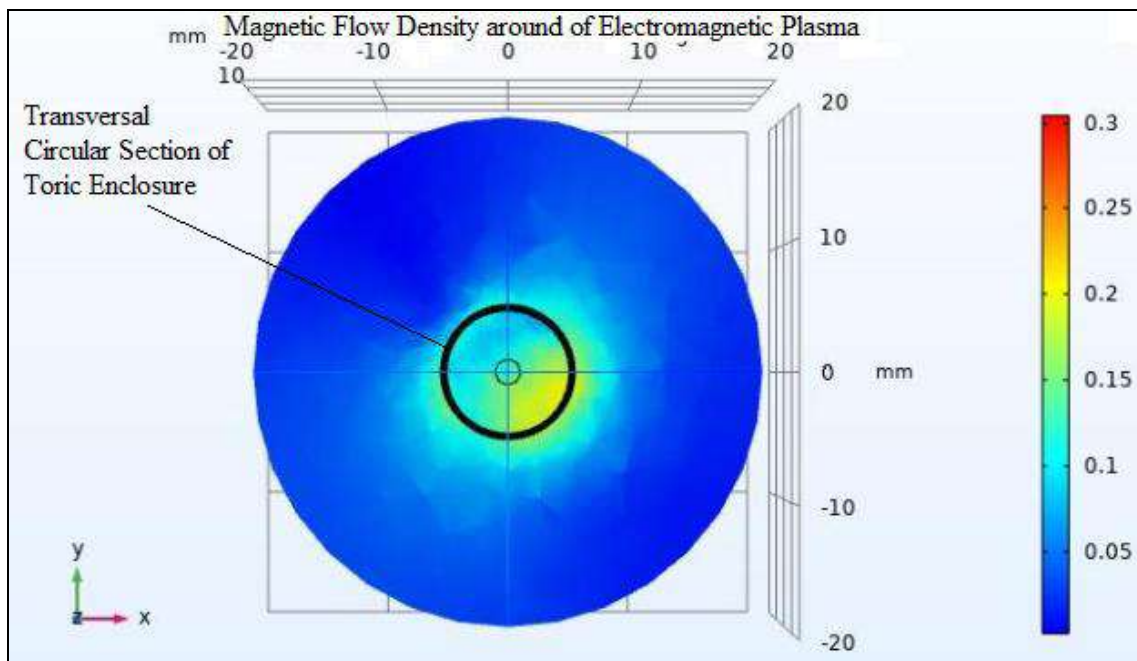
$$v_D = \frac{1}{H^2} (E \times H), \tag{5}^1$$

<sup>1</sup> The general case (to a non-uniform electric field) is given by the equation:

where this velocity field must satisfy the lemma 2. 1<sup>2</sup>, in [1]. Here the electric field is normed or controlled on each particle, electron, ion, all moving in the same direction at the same speed field. Then the value of electrical drift is given by the equation (6). This drift is required to control due the nature of our electromagnetic plasma produced under electronic conditions.



**Fig 2:** Reactor device obeying to the vorticity principles, of the theorem 1. 1, and geometrical design required to obtain a rotation electromotor force to produce a high inertia momentum and obtain propulsion.

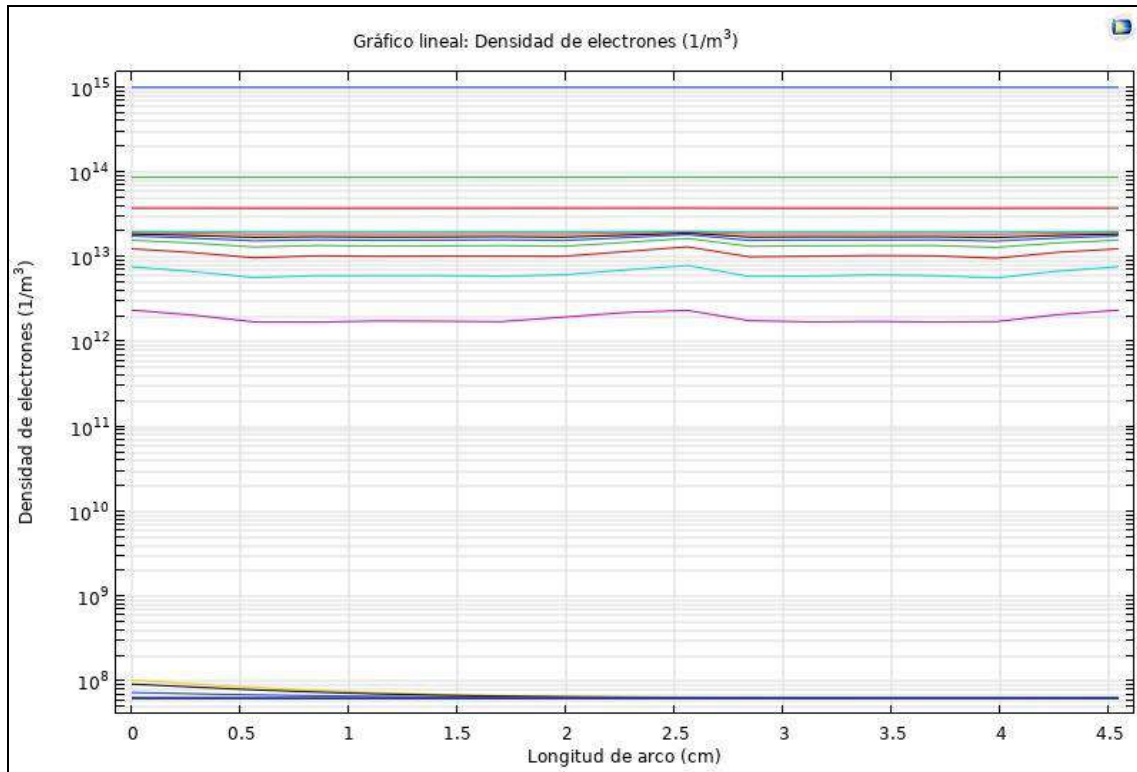


**Fig 3:** Magnetic field from the Neodymium magnet which is perpendicular to the direction of the current. The most high magnetic field intensity is found in the soft blue and yellow. This will do that the plasma be kept in the center inside the torus enclosure. Eight Neodymium magnets are used.

Considering a convenient torus coordinates system deduced of the proper magnetic field  $H$ , which gives form to the electromagnetic plasma to an infinite circuit (see the figure 2 and figure 3) we can establish a control of force and modulation of itself considering the theorem in the next section.

$$\mathbf{v}_D = \left( 1 + \frac{1}{4} \rho_L^2 \nabla^2 \right) (\mathbf{E} \times \mathbf{H}).$$

<sup>2</sup> Lemma [MHD]. The vorticity envelops to the force lines of the induced field for the media movement (media currents) in the field



**Fig 4:** The eight curves (curves more defined) refer to the eight trenches where the electromagnetic plasma advances submitted for the constant magnetic field. The electron density is quasi-flat and varies in the interval  $10^8 \leq \rho_e \leq 10^{15} \mu C/m^3$ . The plasma  $\approx II_H(\rho_e, j)$ , is conformed in this interval.

The saturation electronic level must be high (see the figure 4) to produce a plasma flow with the sufficient force to produce a big torque or rotation momentum, and produce movement. To produce with success this effect we require produce a highest density of electrons in each stretch of torus between two Neodymium magnets (see the figure 2).

**Results**

As a corollary of the theorem 3. 1, and direct consequence of the lemma 3. 1, we have the following proposition.

**Theorem 2. 1.** Let  $\{\xi\}$  be a system of toroidal coordinates defined to the plasma  $\approx II_H(\rho, j)$ . Let  $F(\xi)$ , the magnetic force required to centered or guide the electromagnetic flow of plasma in one direction, defined by

$$F(\xi) = H(\xi)p(\xi, \tau), \tag{6}$$

where  $p(\xi, \tau)$ , is an electronic pulse of type sinusoidal<sup>3</sup>. Then a control  $u(\xi)$ ,<sup>4</sup> will come given by the integro-differential equation <sup>[4]</sup>:

$$u(\xi) = \frac{q}{mc} \left\{ \delta(\xi)H(\xi) + \int_{\xi_0}^{\xi_1} H(\tau)p(\xi, \tau)d\tau + \frac{d}{d\xi}H(\xi) \right\}, \tag{7}$$

Its spectral density will be

$$\kappa(\omega) = \frac{q}{mc} \int_{-\infty}^{+\infty} H(\xi)e^{-j\omega\xi} d\xi, \tag{8}$$

Remark 1. The spectral density (9) will obtain a modulation of the reactor to signal control of the process and others. Possibly here in the derived product from electromagnetic plasma will can be obtained a special sound due the phonons and fermions.

Due to that  $\approx II_H(\rho, j)$ , is submitted to constant magnetic field then  $\frac{dH(\xi)}{d\xi} = 0$ . However, is necessary determine  $H(\xi)$ , along of certain interval  $[\xi_1, \xi_2]$ , since the plasma  $\approx II_H$ , must conserve the shape of the torus during the application of the field  $H(\xi)$ .

<sup>3</sup> Due to the nature of current used in the experiment to the development of the reactor. However, this could be extended to any case with the corresponding transformations of current.

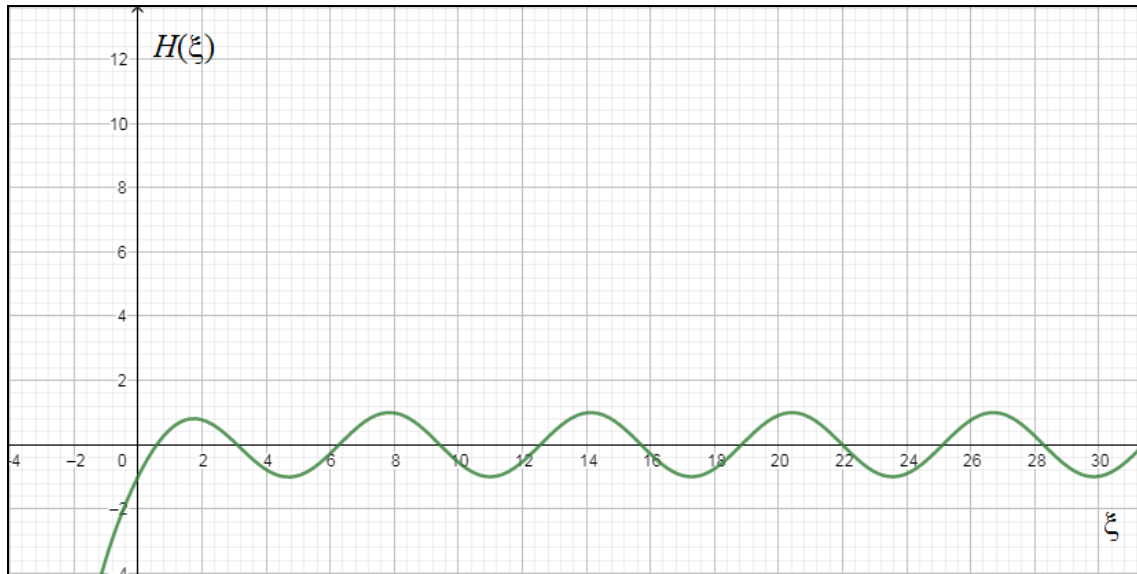
<sup>4</sup> Here we choice a PID controller [4].

For other side, we want use the electrons and other products derived of the electromagnetic plasma, yet the few particles that no achieve direct to the center.

Remark 2. With respect to the control function we choice a function that keep up the magnetic field to create the current that by the Hall Effect establish a constant potential along the reactor. Remember that this is due to the existence of torsion that create the geometry of the plasma <sup>[5]</sup>. Likewise, we can choice the control:

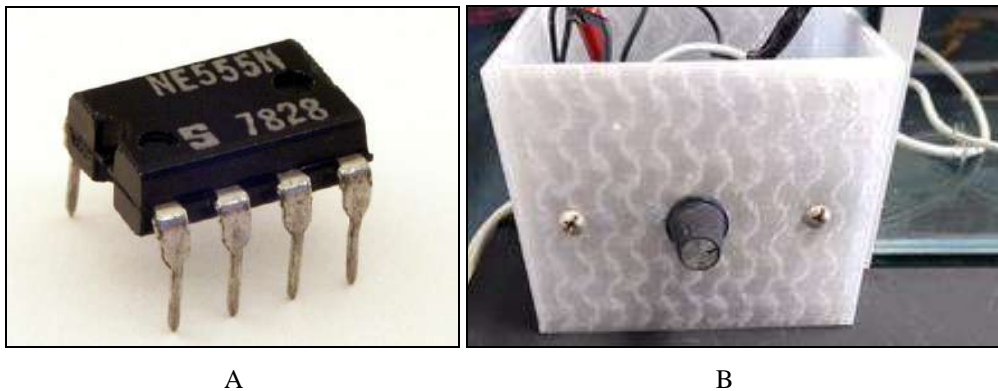
$$u(\xi) = \begin{cases} 1, & \text{if } \xi > 2 \\ +\sqrt{1-(\xi+1)^2}, & \text{if } -2 \leq \xi < 0 \\ -\sqrt{1-(\xi-1)^2}, & \text{if } 0 \leq \xi \leq 2 \\ 0, & \text{if } \xi < -2 \end{cases} \tag{9}$$

Which is the oscillation function  $u(\xi) = osc([-2,2])^5$ .



**Fig 5:** Solution to  $H(\xi)$ , of the integral equation (.). Observe the uniform variation of  $H(\xi)$ , due the control between  $u = 1$ , and  $u = -1$ . This solutions meets exactly with the prediction realized in experimental simulation obtained in the figure 6 on drifting in <sup>[1]</sup>. The electric drifting creates the control of the plasma as was mentioned before section.

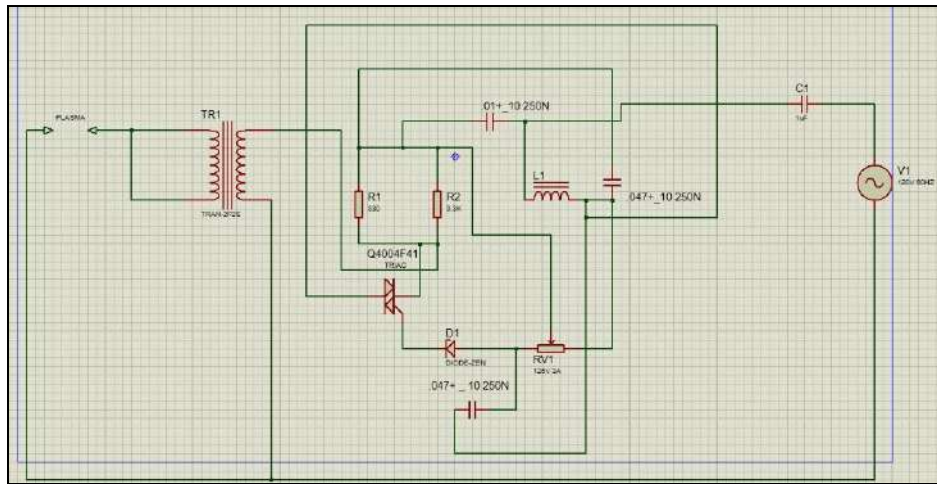
From a point of view of electronics, is created a control of current constructing a current dimmer with control of signals and electronic pulse by a semiconductor circuit NE555N <sup>[6, 7]</sup> (see the figure 6 A)).



**Fig 6:** A) Integrated circuit used in a variety of timer, delay, pulse generation, and oscillator applications. B). Control dimmer of current. The dimmer use current oscillating with sinusoidal voltage with peak voltage  $V_{peak} = V_0 = 225Volts$ , which appear as initial condition given in (5) and (8) to the integral equation of dynamical system of the plasma.

Like wise the details of the dimmer can be seen in the figure 7.

<sup>5</sup> We can consider with big approximation a  $osc([-2,2]) \approx \sin \alpha t$ , with  $\alpha = 1$ .



**Fig 7.** Details of the dimmer circuit created to control and attenuate the current injected to the plasma tube.

We proceed to realize the demonstration of the theorem 2. 1.

*Proof.* We consider the plasma linearized movement equation given in (1) which expresses the forces (applying the Newton’s second law):

$$F_{Total} = F_1 + F_2 + F_3, \tag{10}$$

By the theorem 4. 1., <sup>[1]</sup>, (10) carries a curvature

$$\kappa = \frac{q}{mc} |H|. \tag{11}$$

which can be expressed as function depending of the function  $H(\xi)$ . Then each component in the right side of (11) has curvature  $\frac{q}{mc} H(\xi)$ . We consider the remark 1, and the equation (5), then we have the Laplace transform of the corresponding integral equation of Volterra’s type <sup>[8]</sup>:

$$U(p) = \frac{q}{mc} \left[ h(p) + \frac{V_0}{l^2} H \int_0^\infty e^{-p\tau} d\tau \right] \tag{12}$$

Where the solution or law is:

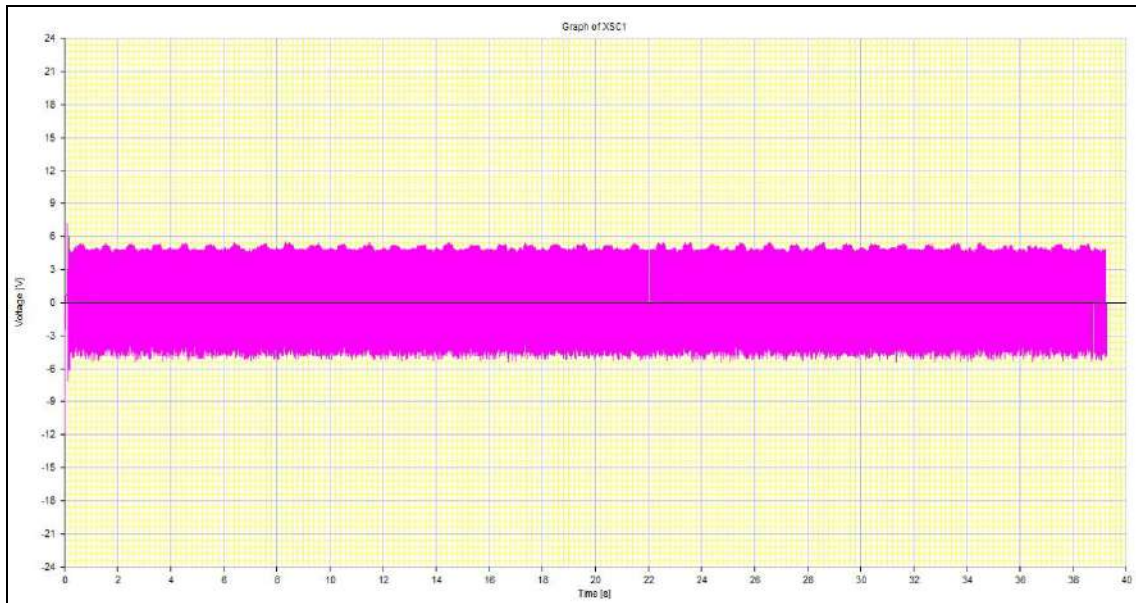
$$H(\xi) = \frac{q}{mc} \left\{ \sin \xi - \frac{V_0 H}{l^2} e^{-\xi} \right\} \tag{13}$$

Then its spectra is the spectral curvature given using (9):

$$\kappa(\omega) = \frac{q}{mc} (\delta(\omega)e^{-1} - i\{\delta(\omega - 1) + \delta(\omega + 1)\}), \tag{14}$$

Again we reproduce the before phenomena with an electromagnetic plasma signal obtained in low frequency.

In the voltage range  $-1 \leq V \leq +1$ , to the short time interval of 39.6 sec. The chart shows an electromagnetic electron wave of frequency  $\omega$ , (or drift), which is a wave in a plasma having a magnetic field component and in which primarily the electrons oscillate around of a guiding center (see figure 8). In this experiment was oscillated a current of 3A.



**Fig 8.** Electronics simulation of drifting effects and superposing particles, in this case electron (as current). Second simulation. Observe that this satisfy the solution obtained in (14), considering  $\frac{q}{mc} \ll 1$ , and  $\frac{V_0 H}{l^2}$ , big.

The current  $1.5A \leq I \leq 3A$ , is controlled by a microcircuit of mouser type, which can be used as a powerful integrated stabilizer from 1.5A until 5A, furthermore of consider a voltage difference that can be re-used by the reactor system considering the corresponding drifting frequency required to central guided of plasma line.

**Derived Products**

The corresponding interaction between microscopic forces (electro-weak and nuclear force (electro-strong)) could be governed by an asymmetric state of the field, which is guided by the electromagnetism with curvature creating one of their effects that is the torsion on the plasma, holding him captive.

However, there are some particles like free electrons, its fermions and leptons, also phonons, which can be can be used for profit of the proper reactor (feedback) and feeding auxiliary systems of ship for example, or control instrumentation.

Likewise, from a point of view of the microscopic level, we can consider the action to these particles and subatomic particles (considering the gravity as essential part of the torsion an evidence of electromagnetic fields and their actions from microscopic level)<sup>[9]</sup>:

$$\begin{aligned} \mathfrak{S}_G + \mathfrak{S}_{QED-fermions} &= \frac{1}{2\chi} \int d^4x o o_\mu^a o_\nu^b R_{ab}^{\mu\nu}(\varpi) + \\ \frac{i}{2} \int d^4x o (\bar{\psi} \gamma^\mu D_\mu(\varpi, A) \psi - \overline{D_\mu(\varpi, A) \psi} \gamma^\mu \psi) &+ \dots \end{aligned} \tag{15}$$

to the Dirac matrices  $\{\gamma^\mu, \gamma^\nu\} = 2g^{\mu\nu}$ , and where  $R^{\mu\nu} = d\varpi^{\mu\nu} + \varpi_\sigma^\mu \wedge \varpi^{\nu\sigma}$ , is the 2-form of curvature. Also  $\chi = 8\pi G_N$ ,<sup>6</sup> is the gravitational constant intimately related with the production of matter by the tensor of energy-momentum in the Universe estimated inside of Einstein field equations. However, the mechanism of the gravity energy with torsion can be explained from the QED and QFT, using the *spinor frame* inside the Dirac equation as has been given in

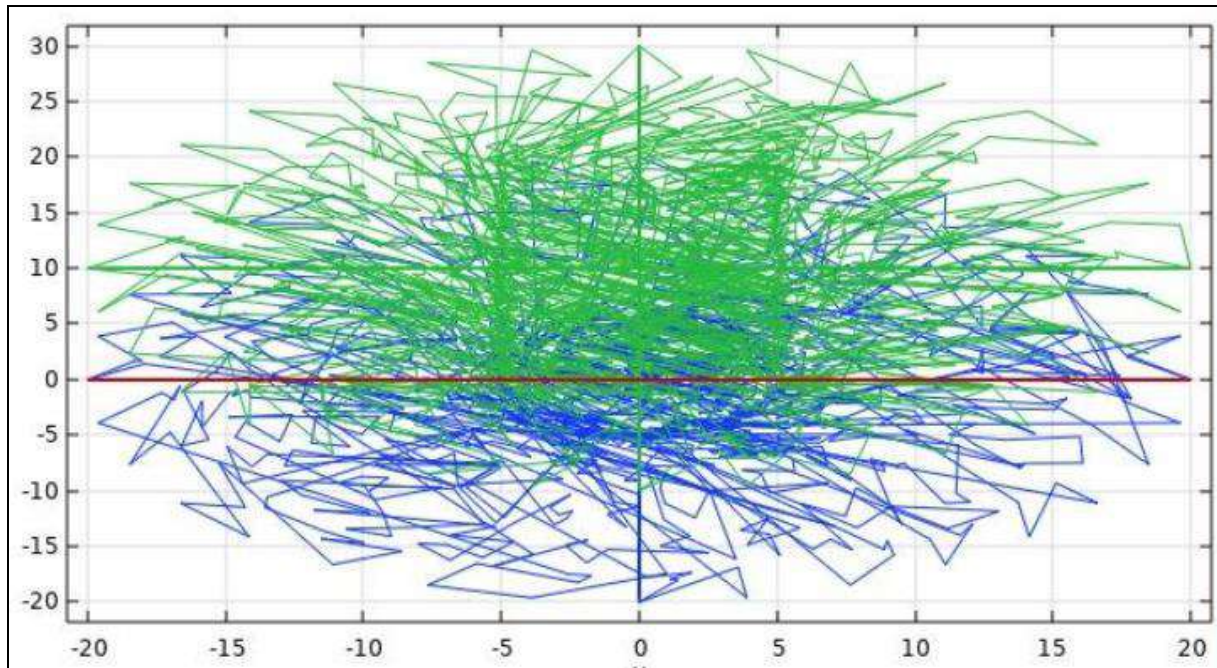
$$(\square + \chi T)\psi = 0, \tag{16}$$

considering the fermion interacting. Here,  $T$ , is a measure of the energy density (mass, pressure, self-gravitation),  $\psi$ , is the corresponding wave function and the constant  $\chi$ , is the gravitation constant given by Einstein equal to  $8\pi G/c^2$ .

Unlike gravitational and electromagnetic fields which are characterized by a central symmetry, torsion fields of the spinning objects possess a symmetry axis. The torsion as gravity, possesses a huge penetrative ability in any of natural media.

*Law-energetic relict neutrinos* are quantum remains of the torsion, which we can call the "tordions". Torsion fields, being, in their nature, similar to the gravitational, these on all reactor system, while that the gravity, when is being modeled, is being treated as a spinal longitudinal polarization, the torsion are being treated as a horizontal polarization of a physical vacuum (see figure 9).

<sup>6</sup>  $G_N = G/c$ , with  $c$ , is a light velocity in the special relativity.  $G$ , is the Newtonian constant of the universal gravitation.



**Fig 9:** Fermion products and another derived product from the plasma as free electrons, leptons, phonons. The simulation shows a classification in two groups of polarization type: the gravity and torsion. The torsion polarization is the majority part given in green. The blue part could be anti-electro-gravity.

The reactor so designed must produce movement from a quantum level with the mechanism due torsion and gravity interaction.

**Conjecture 4. 1. (F. Bulnes).** *The movement is spread ramification from the energy-vacuum mechanism through paths of broson actions similar to (16).*

**Def. 4. 1 (F. Bulnes).** A broson is a hypothetical particle that is a fermion and that come from the  $D$  –Branes <sup>[10]</sup>, being this wrapped by gauge bosons in the space-time.

Can be consulted on branes dynamics <sup>[11]</sup>.

The gauge bosons produce torsion in the microscopic space due the electromagnetic characteristic of these bosons that are photons <sup>[12]</sup> realizing back-reaction <sup>[13]</sup> with the covered space by the gravity. Of fact, in the non-Abelian electromagnetic theory are produced “ghost” (states of negative norm or fields with the wrong sign of the kinetic term) linked to every particle whose effects are predicted by Faddeev-Popov <sup>[14]</sup>.

Every gauge field has an associated ghost, and where the gauge field acquires a mass via the Higgs mechanism, the associated ghost field acquires the same mass (in the *Feynman-t Hooft gauge* only, not true for other gauges).

From the point of view of *QFT* and particle physics, there is a weak field that keeps unified to the neutron and this is associated with the gauge boson, that is to say, the  $W$  boson. This weak field has an electromagnetic nature.

The neutron when there exists outside of the atomic nucleus is transformed after of the ten minutes in an electron, anti-neutrino and one proton, that is to say is, ready to shape matter and antimatter in the required proportion that need our material image of our Universe.

Then with some of these remainders can be produced anti-electro-gravity <sup>[15]</sup>.

## Conclusions

In this second part of previous paper, we have obtained a concrete form to obtain and develop an electromagnetic plasma considering this as a fluid  $\approx II_H(\rho, j)$ , which must be caught inside the torus enclosure and controlled by the magnetic field considering its magnetic force required to centered or guide the electromagnetic flow of plasma in one direction and given by the relation (7).

Likewise, is analyzed the dynamical system defined by the integral equation (8) considering the system as feedback system choosing a PID controller, where are establish an additional conditions on the control design to obtain a law established by (14), which consider the flow and movement of the plasma inside of the oscillation interval  $-1 \leq V \leq +1$ , of the plasma. This oscillation interval meets with the imaginary components of impulse functions in terms of  $\omega$ , given as part of the spectral curvature of the magnetic field used to control the flow and encapsulation of the plasma. Again we reproduce the before phenomena with an electromagnetic plasma signal obtained in low frequency, which is showed by the chart of figure 8.

As a part important also were discussed the fermion products and another derived product from the plasma as free electrons, leptons, phonons. Here and through a development of capture systems of these derived products from the electromagnetic field, considering may be matter condensed principles and other principles as ionization and multi-poles (or multi-radiative phenomena); could be used to reactor feedback, even to feed auxiliary systems of a ship where the reactor determined by the



electromagnetic plasma will be the fundamental motor to the movement and flight of this ship.

*"Everything is in movement, from the elementary to the complex, from beginning to end"*

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### Notation and Abbreviations

TQFT- Topological quantum field theory

$\approx II_H(\sigma, E)$  – Plasma fluid space with characteristics of electrical field and conductivity.

$\sigma$  –Electrical conductivity.

$H(\xi)$  – Magnetic field intensity in a toroidal coordinates  $\xi$ .

$\kappa(\omega)$  – Spectral curvature.

$q$  –Electrical charge.

$c$  –Light velocity  $\approx 299,792,458$  meters/sec.

QED-Quantum Electrodynamics.

$m$  –Plasma mass.

$l$  – It's a distance corresponding to a cycle of the cylindrical spiral in the drifting process inside the plasma.

$H$  –Magnetic field intensity or simply magnetic field.

$\approx II_H(\rho, j)$  – Plasma fluid space with characteristics of electrical current and density.

$h(p)$  – Laplace transform of the magnetic field intensity in a toroidal coordinates

QFT- Quantum field theory.

$D$  –Branes- It is a brane type that from a point of view of the algebra is an algebraic  $D$  –module. As a physical entity is fabric of strings, creating objects of two or more dimensions.

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