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Electromagnetic plasma reactor: Implicit application of field torsion I

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Abstract
In diverse works on electrodynamics, field observables and other related phenomena to produce electro dynamical process from a purely electromagnetic source (reactor), is described the determination of a line of electromagnetic plasma and their possible contention to produce a Lorentz force to movement and propulsion of a hypothetical vehicle. Likewise, considering as geometrical invariant and field observable the torsion is designed and developed an electronic device with an infinite cycle of electromagnetic plasma as the fundamental base of the reactor. Several electronics experiments are realized to verify the results.

Keywords: Electromagnetic fluid, electromagnetic plasma, field torsion, infinite cycle, magnetic fluid, reactor

Introduction
The electrons themself are fermions in the material context. Likewise, the photon quality of fermions when these are photons of information between electrons, determine many interesting processes from electromagnetic fields involved in an electromagnetic flow called electromagnetic plasma by us. Of fact, the electromagnetic plasma no necessarily must be considered as an electromagnetic object result of superconducting. This can be result of a multi-irradiative electromagnetic field, which directs and conducts through magnets and dielectric materials. Also can considered in plasma physics inside the MHD (Magneto-Hydrodynamics) as a magnetic fluid [1]. This will generate derived field products from microscopic level [2]. These microscopic electromagnetic products are fermions, which managed through their Majorana states, can produce interesting effects as electro-anti-gravity [2]. However, this is not the principal goal of this research.
Here we are interested in the possibility and their justification to design and developed a reactor of purely electromagnetic nature using the field torsion as integrative element of the electromagnetic plasma, its implicit existence in all dynamical processes in the Universe included the corresponding to the forming of sidereal objects, and astrophysical space-time phenomena [3].
Likewise as electromagnetic plasma, we define the fourth state of matter consisting as electromagnetic fluid with high concentration of electrically quasi-neutral medium of unbound positive and negative particles (its total charge is zero), which when are moved to certain velocity produce infinite conductivity.
The corresponding circulation of a line (as circular ring of plasma inside a torus) must be with high velocity to generate a Lorentz force, sufficiently strong to impulse and move an object, likewise creates an energy self-generation to permanent energy feeding and its use in levitation and flying object processes. The field torsion could be used to establish and prove the indicium of the Lorentz force in the space agitating, provoking its undulation, energy that also can be used inside flying and displacement of the ship. Also, can be established the geometrical conformation of the plasma in the space through the magnetic field.

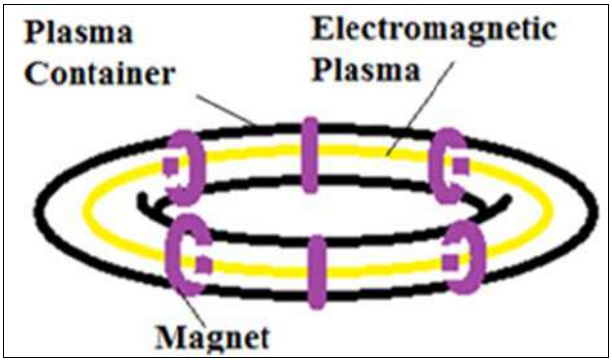

Fig 1: The double magnetic layer principle stays defined with the magnetic field of each magnets and the magnetic field generated by the current in the electromagnetic plasma.

Magnetic Field: Material Transportation and Topological Transformation of Plasma

We will call the fluid $\approx ||_e$, electromagnetic plasma. This is a functional space characterized as:

$$\approx ||_e(\mathbf{v}, \rho) = \approx ||(\mathbf{v}, \rho_e), \qquad (1)$$

Where ρ, the density of electromagnetic fluid as set is, that is to say, is the density of ions and cations of charged particles. $\mathbf{v}$, is the velocity of the charged particles, which can be accelerated or braking by a magnetic field. ρ_e, is the density of charged particles.

Lemma (F. Bulnes) 2. 1. All fluid $\approx ||_e$, in the Universe (terrestrial as well as sidereal) is a magnetic fluid.

Proof. [4]. ◆

Likewise, by MHD, all electromagnetic plasma is a magnetic fluid, which can be transformed topologically through the equations

$$\frac{\partial \mathbf{H}}{\partial t} = \text{rot}(\mathbf{v} \times \mathbf{H}) + \frac{c^2}{4\pi\sigma\mu}\Delta\mathbf{H}, \qquad \text{div}\mathbf{H} = 0, \quad (2)$$

Where these electrodynamical equations establish the behavior of the fluid in its magnetic characteristic taking in consideration the interaction effects more close or immediate to the equilibrium.

Infinite Electromagnetic Plasma Circuit

The electromagnetic plasma can be defined as the magnetic fluid $\approx ||_H(\sigma, E)$ [1] (see the lemma published in [4] in advanced studies in electrodynamics). The electron flow is continuous and saturated in electrons (with high electron density) due to the electric permanent current. We consider as infinite circuit a tube whose co-cycle of current has constant circulation (see Fig 1):

$$\oiint_S \Omega_H dS = \oint_{\mathfrak{T}} \mathbf{v} dl = 0, \qquad (3)$$

The tube [2] is the device (defined as topological vector space):

$$\mathfrak{T} = \{\Omega_H \in \approx ||_H(\sigma, E) \,|\, \text{div}\Omega_H = 0\}, \qquad (4)$$

Where Ω_H, is the electromagnetic vorticity given by the equation

$$\Omega_H = \text{rot } \mathbf{v}, \qquad (5)$$

Where $\mathbf{v}$, is the velocity obtained on the plasma due the magnetic flow density that acts through magnetic field lines:

$$\frac{\partial \mathbf{B}}{\partial t} = \text{rot}(\mathbf{v} \times \mathbf{B}), \qquad (6)$$

Likewise, we define the reactor as the space:

$$\mathcal{R} = \{ j \in \mathfrak{J} \,|\, \text{rot}H = j\}, \qquad (7)$$

Where is required a permanent current inside the reactor. This permanent current is obtained in the device by the double magnetic layer principle.

The magnetic energy acting on the plasma of current j, satisfies to the hypothetical magnetic state potential φ_m, given for [5]:

$$\text{div grad}\varphi_m = \text{div } H = 0, \qquad (8)$$

That is to say, the magnetic intensity lines follow being closed to any exterior point to the electromagnetic plasma current inside the space. Now is necessary to establish that the torsion is implicit in the electromagnetic plasma and determined by a magnetic field, this due to the conjecture on the physical nature of torsion in the Universe, which as a second curvature can be established as:

Conjecture 3. 1. The nature of torsion is magnetic [3].

In addition, we need the following lemma.

Lemma 3. 1. [1]. The vorticity $\Omega_H = \text{rot } \mathbf{v}$, envelops to the force lines of the induced field for the media movement $\approx ||_e$, (media currents) in the field H.

Proof. We use the Kelvin circulation theorem and Helmholtz theorem with its corresponding corollary to describe the twistor lines in the vorticity flow. ◆

Then is necessary to enunciate the following theorem.

Theorem (F. Bulnes) 3. 1 The vorticity $\Omega_H = \text{rot } \mathbf{v}$, involves a torsion in the space $SO(2, \mathbb{C})C(p)$, whose nature is magnetic. The circles are formed as "freeze fields".

Proof: The demonstration will take form if we demonstrate that in the vorticity field generated by magnetic field acting on plasma evidencing torsion that varies respect to the distance from the current circle ring. As magnetized body will be the reactor contender, which act on a current whose generated magnetic field satisfies $\text{div}H = 0$.

A vortex is a physical curl whose generatrix surface is the

inverted cone $\mathbb{C}$, where its curves or trajectories are conic spirals. Then exists torsion if and only if $\Omega_H \neq 0$. The torsion is of magnetic nature by conjecture 2. 1. Then the torsion must be evidenced in the magnetic field used on the current that circulates as circular ring. Indeed, we consider the magnetic energy state due by (6) for the current circle:

$$\varphi_m = \frac{I}{4\pi\gamma}\Sigma, \qquad (9)$$

We define the space:

$$C(p) = \{\mathbf{v} \in T_p(\Sigma) | \Omega_H = \text{rot } \mathbf{v}\}, \qquad (10)$$

with solid angle of vortex Σ, where current circulate on circular ring which can increase until the equator of the sphere of radius r, see the Fig 2.

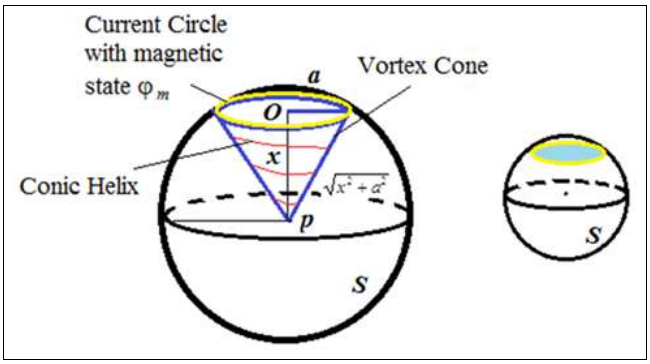

Fig 2: Vorticity.

We consider a little sphere S, of radius r. In the movement on cone, the variation of the solid angle is given by

$$d\Sigma = f'(r)dA = -\frac{2h}{r^3}dA, \qquad (11)$$

Then the current circle can increase until the sphere equator, having that

$$\cos\theta = \frac{\sqrt{x^2+a^2}}{\sqrt{x^2+a^2}} = 1.$$

Then for a cone whose variations are given by (11) from its base until vertex in *p*, we have that the solid angle is:

$$\Sigma = \iint_S d\Sigma = -2\iint_S \frac{1}{r^2} r dr d\theta = \frac{2\pi h}{r} =$$

$$= 2\pi(1-\cos\theta_1) = 2\pi\left(1 - \frac{x}{\sqrt{x^2+a^2}}\right), \qquad (12)$$

Working a little part the expression

$$1 - \frac{x}{\sqrt{x^2+a^2}},$$

We have its equivalent expression [4]:

$$\Sigma = 2\pi\left[\frac{a^2}{x^2+a^2+x\sqrt{x^2+a^2}}\right], \qquad (13)$$

Which involves a torsion of the corresponding conic helix [5] in vorticity. Indeed, we can apply the complex transformation:

$$T : D_\Sigma \to \mathbb{C}, \qquad (14)$$

With correspondence rule

$$(x^2, a) \mapsto \frac{a^2}{a^2 + z\bar{z} + r^2(a+z\bar{z})^2}, \qquad (15)$$

With $z = 2i, \bar{z} = -2i,\ x^2 = b^2t^2 = z\bar{z},\ a = 2,$ and $r = \sqrt{x} = bt.$ Then we have the torsion given in the footnote 3, considering the frequency b, depending of other parameters.

Likewise, we consider the annular magnetic fields defined by the magnetic contender that come given by the Maxwell equation $\text{div}H = 0,$ which establish along the current inside $\mathcal{R}$, current circles of length $2\pi a, a > 0.$ Then its magnetic field is the gradient of its magnetic potential:

$$H = -\text{grad}\varphi_m = -\text{grad}\left(\frac{I}{4\pi\gamma}\Sigma\right) =$$

$$-\frac{I}{4\pi\gamma}\frac{d\Sigma}{dx} = -\frac{I}{4\pi\gamma}2\pi\left[\frac{a^2}{\left(\sqrt{a^2+x^2}\right)^3}\right]$$

$$= \frac{I}{2\gamma}\frac{a^2}{\left(\sqrt{a^2+x^2}\right)^3}, \qquad (16)$$

The magnetic field involves the torsion given in (15). ◆

Experiments, Design of Reactor and Results

The purely electromagnetic plasma satisfies the homology $H^1(\Pi(X),\Omega) \cong H^1(P\mathcal{T}, O(-2,-2))$, [6] page 257 [6] with the current superconducting effect obtained in magnetic levitation. This superconducting current can be constructed though pure classical electromagnetism using the homology relations explained in [2, 6, 7].

For example, the lines in the twister generated for the magnetic field in movement (rotation ring of the vehicle) can be illustrated in the Fig 3.

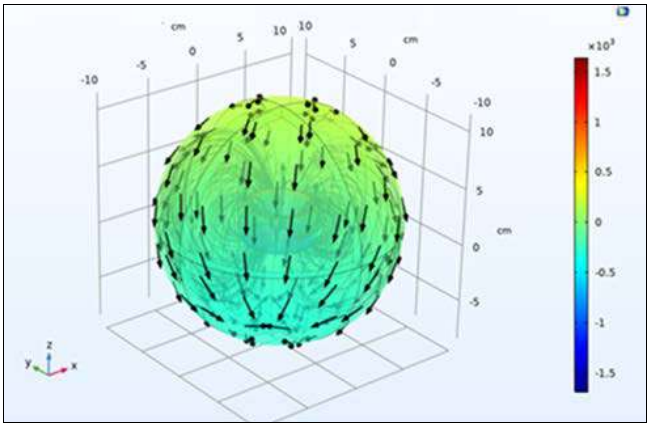

Fig 3: Magnetic flow with critical temperature major or minor than transition temperature. The impulse is obtained of the magnetic field that pass across of the cylindrical ring [7].

We consider the plasma linearized movement equation [8]:

$$\rho_m \frac{\partial \mathbf{v}}{\partial t} = \boldsymbol{j} \times \boldsymbol{B} - \nabla P - \rho_m \nabla \phi, \qquad (17)$$

Then we have the following result considering the lemma 2. 1, with the identity (1) in the version for plasma physics of the electromagnetic plasma $\approx \mathrm{II}_e(n\mathbf{v}, \boldsymbol{j}) = \approx \mathrm{II}(\boldsymbol{j}, \rho_m)$:

Theorem (F. Bulnes) 4. 1. Let $\approx \mathrm{II}_H(\sigma, E)$, be the plasma. We consider the equation (17) with forces on electrical charges q, and mass m, in the Gauss unit system. Then its curvature is given by

$$\kappa = \frac{q}{mc}|\boldsymbol{H}|, \qquad (18)$$

Proof. We consider (17) to the plasma $\approx \mathrm{II}_H(\sigma, E)$, characterized as $\approx \mathrm{II}_e(n\mathbf{v}, \boldsymbol{j})$. Then (17) takes the form

$$m\frac{d\mathbf{v}}{dt} = m\boldsymbol{g} + q\left(\boldsymbol{E} + \frac{1}{c}\boldsymbol{\upsilon} \times \boldsymbol{H}\right), \qquad (19)$$

Nulling the electric and gravitational fields while the magnetic field is constant in the space and the time, we have:

$$\frac{d\mathbf{v}}{dt} = \frac{q}{mc}\boldsymbol{\upsilon} \times \boldsymbol{H}, \qquad (20)$$

Which is always perpendicular to velocity $\boldsymbol{\upsilon}$. Then its effect is thus the curvature (18). ◆

Supposing that initially $\boldsymbol{\upsilon}$, is perpendicular to $\boldsymbol{H}$, and equalizing $\frac{d\mathbf{v}}{dt}$, to the centripetal acceleration equation $\frac{\upsilon^2}{r}$, where r, a curvature radius is, considering a homogeneous magnetic field, the trajectory to particle is constant (circular trajectory) and its angular velocity (its cyclotron frequency) is

$$\omega_{cyclotron} = \frac{qH}{mc}, \qquad (21)$$

If we consider a perpendicular speed to the magnetic field of υ, the radius of the orbit, called the gyro radius or Lamoure radius, is

$$r = \frac{\upsilon}{\omega_{cyclotron}}, \qquad (22)$$

We consider as fundamental frequency $\omega = \omega_{cyclotron}$.

Then its curvature energy is:

$$\kappa(\omega) = \frac{q}{mc}\int_{-\infty}^{\infty} H(r)e^{-j\omega r}dr, \qquad (23)$$

The dimensional analysis of curvature is given for:

$$\left(\frac{C\dfrac{Kg}{C\sec}}{Kg\dfrac{m}{\sec}}\right)\left(=\frac{\dfrac{CKg}{C\sec}}{\dfrac{Kgm}{\sec}}\right)\left(\frac{Kg\sec}{Kg\sec m}\right)\left(=\frac{1}{m}\right)(=\kappa),$$

Likewise, the magnetic field signal can be given as

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

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.

Then the units of curvature energy are $\frac{V}{m^3}$, [9].

Due to the conjecture 3. 1, [10] and the corollary studied and published in [10, 11], where the torsion energy is its curvature energy, we have that the particles transport is realized under magnetic field in any geometrical symmetry [12]. Even in asymmetric plasmas. We are interested in the cylindrical symmetry of infinite or finite cylinders of diverse transversal sections, as well as of torus of circular sections $S^1 \times S^1$.

Likewise, to a convenient torus coordinates system deduced of the proper magnetic field $\boldsymbol{H}$, which gives form to the electromagnetic plasma to an infinite circuit [8]. Also, considering the works [12, 13] (see Fig 5), we can characterize a magnetic force in torus coordinates ζ, as

$$F(\zeta) = H(\zeta)p(\zeta, \eta),$$

Where $H(\zeta)$, is the integral along a field line derived from the scalar pressure equilibrium

$$\nabla P = \frac{1}{c}\boldsymbol{j}\times\boldsymbol{B}, \text{ And } p(\zeta,\eta),$$

is a pulse signal having:

$$A(\omega) = \int_{-\zeta^*}^{\zeta^*} F(\zeta)e^{-j\omega\zeta}d\zeta, \qquad (24)$$

Then we could obtain the infinite cycle with torus geometry of electromagnetic plasma, under considerations of torsion and curvature established.

If the velocity has initially, a component parallel to $\boldsymbol{H}$, this component will be constant and the movement is the composition of two movements; the rotation around field direction of field and a translation in said direction (see the Fig 4).

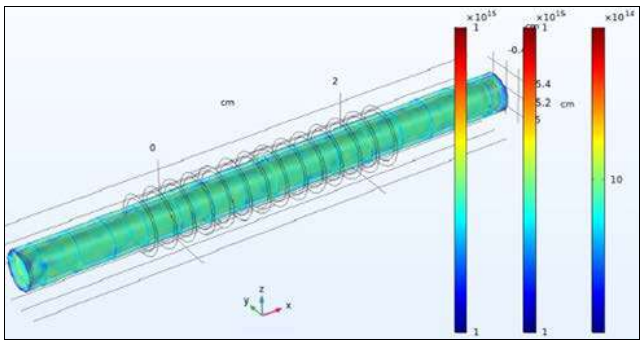

Fig 4: 3-D linearized model of electromagnetic plasma [7].

We realize some experiment from electronics homology to produce the same effects of electromagnetic plasma under control of currents and voltage.

To produce an electromagnetic plasma in laboratory to experimental level, we consider capacitors of $100\mu f$, at $25Volts$, in parallel disposition to do to work the electromagnetic bovine (see the figure 5 A and B).

A B

Fig 5: A). Obtaining of electromagnetic plasma in electronics laboratory. B). Electromagnetic plasma in roundness container of crystalline material [14].

Then the movement of electrons as particles are superposed and conform the circles of plasma longitudinal advance how can be simulated in the figure 4. This superposition of a relatively fast circular motion around a point generates low and speed drifts of this point. These different drifts can differ for various species depending on their charge states, masses, or temperatures, possibly resulting in electric currents or chemical separation. In this last point, the chemical decomposing can derived in singular particles as different fermions [15] and different particle species, which can be used, as was mentioned in the introduction, in generation of effects as diamagnetism, magnetic twisters, and etcetera, generated from the equation (20) to different dispositions of the velocity field respect to the magnetic field.

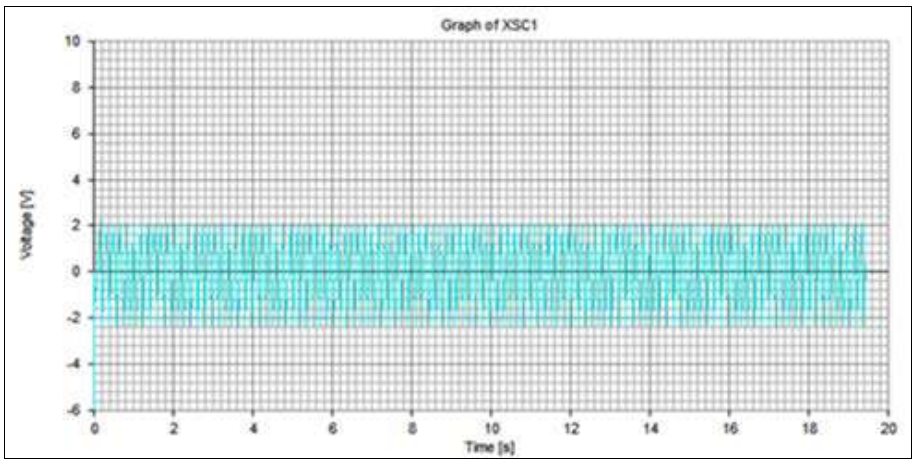

Fig 6: Electronics simulation of drifting effects and superposing particles, in this case electron (as current).

Likewise we reproduce the before phenomena with an Electromagnetic plasma signal obtained in low frequency. In the voltage range $-2 \le V \le 2$, to the short time interval of 19.3 sec. The chart shows an electromagnetic electron wave of frequency ω, (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 Fig 6). In this experiment was oscillated a current of 3A.

The current $1.5\text{A} \le I \le 3\text{A}$, is controlled by a microcircuit of mouser type, which can 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.
Then the reactor can be the central motor to a possible flying vehicle which obtains derived products from electromagnetic plasma as Lorentz force, and the another products from the several and different drifting effects and torsion effect (see the Fig 7).

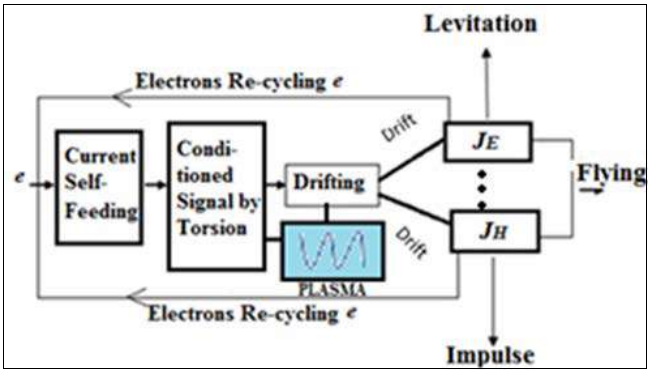

Fig 7: Reactor block diagram.

Conclusions

To obtain the reactor design through electromagnetic plasma, we need establish certain invariants and intrinsic properties of the plasma as magnetic fluid before of consider it as an electronic fluid. This carry us to establish certain geometrical invariants as the curvature and torsion, which born of the field theory as observables, but that determine the geometry of the plasma under magnetic field conditions. Likewise, using the MHD we establish the construction of infinite cycle (circular plasma torus), which is the natural geometry due to the nature of the torsion in the vorticity phenomena, which is observed in different states of some sidereal objects as galaxies in early phase. However, more beyond of the astrophysical considerations, we can characterize the electromagnetic plasma as a topological space $\approx \mathbb{H}_H(\sigma, E)$, which establish the torsion in the space $SO(2,\mathbb{C})C(p)$, (rotations on an inverted cone) whose nature is magnetic. Considering the equation (17) and the before expressed, we can establish and expression of curvature in plasma, which suggest other effects due torsion in the field context and under conditions of the magnetic field respect to the velocity as the various and different drifts and the different particle species as was mentioned. This could give the generation of effects as diamagnetism, magnetic twisters, and etcetera, generated from the equation (20) to different dispositions of the velocity field respect to the magnetic field. Finally, the curvature energy and its torsion energy can be useful to development of conditioning of signals in cyclotron frequencies and its electronic manipulation to control of plasma in a pure electromagnetic treatment of this. The experiments realized demonstrate until certain point this and verify in big measure the results demonstrate in analytical way. A Lorentz force, can be characterized in a natural way from this perspective.

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