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Tokamak, Accelerators, Colliders and Maxwell's Electrodynamics

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I. Introduction

2016 marks 10 years (2006) the beginning of the project between Russia, EU, USA, Japan, China, Korea and India for the joint construction of the International Thermonuclear Experimental Reactor (ITER) in France based on the tokamak. Prospects for the tokamak as a thermonuclear (14 MeV) neutron source are examined. In June 2016 it was reported to delay completion of the work from 2020 to 2025. Today, we can talk about a complex problem faced by the creators of the ITER project, because for the calculation of electrodynamics in a tokamak currently used classical equations of Maxwell. Real electrodynamics inside the tokamak is very different from the calculation [1]. Hot plasma particles move along magnetic field lines of arbitrary topology to the walls of the tokamak and destroy it. Here is a brief history of tokamak. In June 1950 soldiers Oleg Lavrent'ev wrote in a letter to the Academy of Sciences of the USSR, which proposed to create a system with electrostatic confinement of hot plasmas for controlled thermonuclear fusion (CTF). CTF is a synthesis of heavier atomic nuclei of lighter atomic nuclei with the release of large amounts of energy. At a temperature of 100 million degrees initial nucleons or light hydrogen nucleus can overcome the electrical repulsion force and the distance of the nuclear forces of gravity to form heavier nuclei of helium atoms. Natural fusion reactor, the sun, which is already billions of years are uncontrollable processes of nuclear fusion of helium nuclei of hydrogen deuterium. In terrestrial conditions, an inexhaustible source of hydrogen for thermonuclear power can become water. Initiative O.Lavrent'ev to create a magnetic trap for the hot plasma Support was academics Andrei Sakharov and Igor Tamm. In october 1950, they offered a toroidal device with longitudinal magnetic field to keep the hot plasma, now known as the tokamak. The world's first toroidal unit with a strong longitudinalmagnetic field TMF (torr with the magnetic field) was built in 1955 in the USSR. In 2015 modernized the tokamak T-15, plasma confinement duration in which less than 1s, while both the draft T-15 retention time in a steady state plasma should be 5-10 seconds

Oleg A.Lavrent'ev (07.07.1926 – 10.02.2011) | Andrei D.Sakharov (21.05.1921 – 14.12.1989) | Igor E.Tamm (08.07. 1895 – 02.04. 1971)

Figure 1: The initiators of the research into controlled thermonuclear fusion based on the tokamak.

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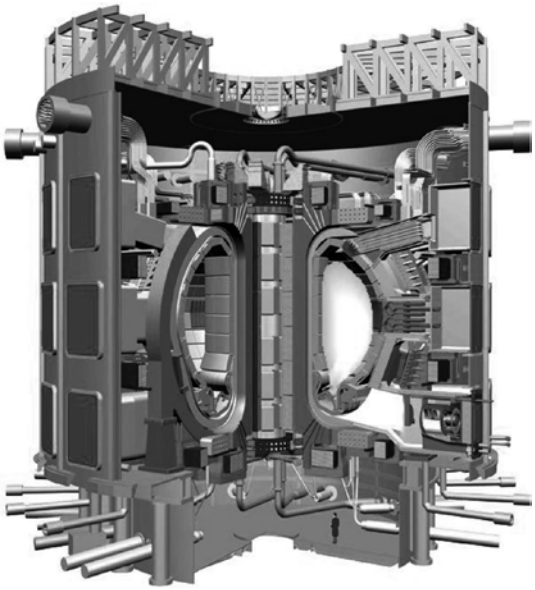
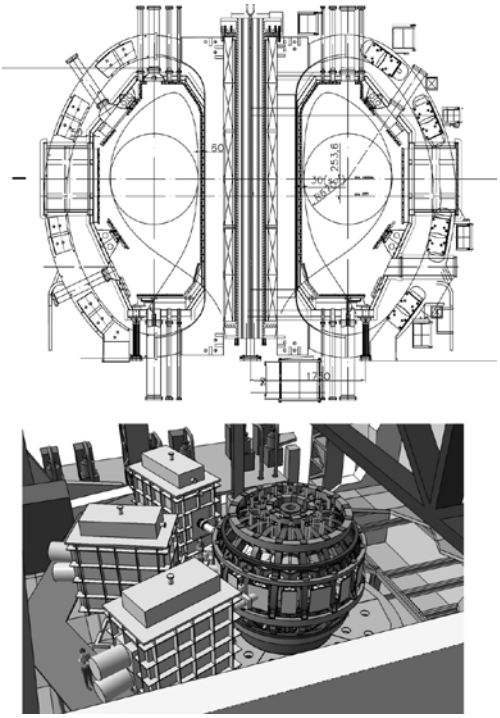


Poloidal section of ITER reactor
To estimate the size of ITER in the lower part of the figure shows the silhouette of a man.



The cross section of the Tokamak T-15 (a) placing the T-15 tokamak in the experimental room (b)

Figure 2

II. Real Electrodynamics Inside the Tokamak

Tokamak is a toroidal chamber with magnetic coils, designed for magnetic plasma confinement in order to achieve the conditions necessary for the occurrence of controlled thermonuclear fusion. To create the magnetic trap uses a combination of magnetic fields: strong toroidal field Bt and a weaker (100 times) poloidal field Bp, as well as the Bi field current I, flowing through the plasma column. It is believed that the plasma is stable in a tokamak if the criterion Shafranov - Kruskal:

$$Bt / Bi > R / \alpha \qquad (1)$$

where R - radius of the circumference of the plasma ring, α - the radius of the cross section of the plasma column.

However, due to the effect of self-generation strong toroidal magnetic field Ht poloidal magnetic field Hp, and vice versa, hold the plasma in a tokamak a long time is not possible. The more intense toroidal magnetic field generated by the windings of the toroid, and it reaches 3-5Tl in the tokamak, the more intense extra poloidal magnetic field will be created by it. Chief Scientific Officer of the Siberian Branch of the Russian Academy of Sciences, professor V. V. Aksenov experimentally and mathematically substantiated the effect of self-excitation and the uncontrolled growth of magnetic fields. This leads to uncontrolled instabilities of plasma column [1, 2]. Self-excitation process will grow almost instantly due to the mutual generation of the above-mentioned magnetic fields. When the temperature rises inside the tokamak diffusion rate will also increase due to the growth of the resistance (conductivity drop) the plasma column and growth of the poloidal field inside the tokamak. Today in EAST tokamak Chinese Institute of Plasma Physics succeeded in a record time of plasma confinement during the 30s, and in the ITER project is necessary to achieve the following: at steady state Pfus = 0,4-0,5 GWt and Q> 5 and to bring the length of the plasma confinement before 3000s. In the natural fusion reactor, such as the Sun, regularly observed coronary solar plasma emissions, which indicates the instability of a solar reactor. Such plasma emissions from a fusion reactor could lead to an environmental disaster.

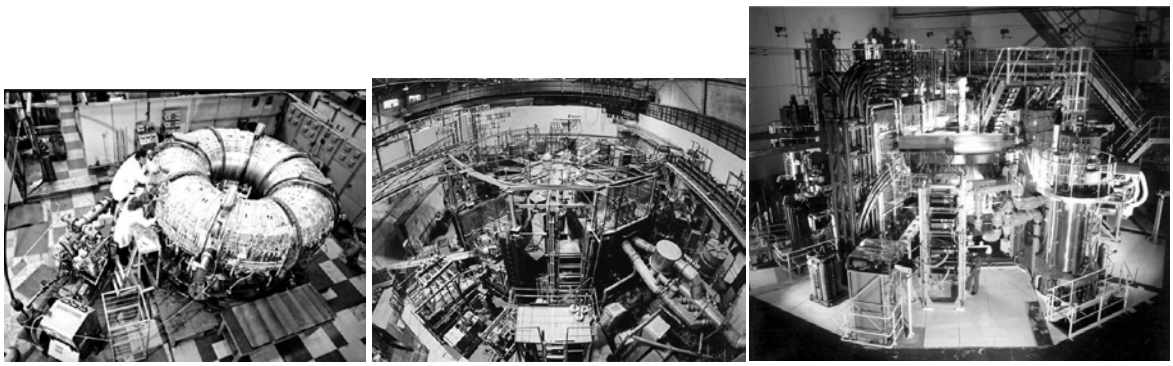


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Figure 3: Tokamaks with superconducting coils: (a) the assembly of the superconducting coils of the tokamak T-7, (b) T-15, (e) ITER.

III. Paradoxes in Electrodynamics Theory

In the early 20th century it became clear that Maxwell's electrodynamics requires revision and improvement. But it took more than 100 years, and this task is not finished today. Attempts by a number of scientists [1,3,7,8,9] to point out the obvious contradictions and paradoxes of the classical and quantum electrodynamics encounter complete misunderstanding and fierce opposition from the apologists of the ruling today in the physics of Einstein's SRT and GRT. As a result the Maxwell equations have been separated from the original model of the environment in which the conduction currents and displacement played a very definite physical role. Since then, the electrodynamics of Maxwell lost virtually every opportunity its additions, changes and improvements. Currently in electrodynamics accumulated a lot of contradictions and paradoxes, which, in the framework of modern theoretical concepts do not have an explanation. Here are some of them:

1) The paradoxical role of the bias currents in the induction of the magnetic field of the moving charge. In the modern sense of electrodynamics is dominated by the belief that only the magnetic field generated by currents transfer jt(r) # 0

$$rotH = 4\pi /c\ jt, \qquad (2)$$

$$divH = 0$$

What is bias currents? Maxwell called component jb=1/4π (dE /dt) in their equations "bias current", meaning that the electric field is created in the luminiferous ether due to the relative motion of its constituent oppositely charged particles that form the dipole. On the one hand the bias currents are a physical reality, because without them it is impossible to understand the workings of a simple capacitor, on the other displacement currents - a mathematical formality, with which it is possible to make the symmetrical Maxwell equations. On one side of the magnetic properties of bias currents are taken to be equivalent magnetic currents transfer properties, on the other hand charges moving magnetic fields are determined for some reason, only the transfer currents as the bias currents are thus missing.

2) Erroneous application of Gauss's theorem not only for resting the charge, but also for moving. As a result the dynamic state of the moving electric charges simply replaced by their static state. However, experimentally established parallel interaction of moving charges e1 and e2 with v1 = v2 = v and v (r) = 0, and the force of interaction between the charges in their motion changes. Coulomb's law (Gauss theorem - one of Maxwell's equations) is valid only for fixed charges. As part of the well-known concepts in electrodynamics, the magnetic interaction between the two at all ruled out moving in a straight line charges. Although experimentally obtained an interesting relationship to the magnetic fields interacting charges moving in a straight line. Experiments confirmed the existence of longitudinal forces between charges moving in a straight line [3];
3) It is ironic, but the differential equations of Maxwell are not able to correctly describe the phenomenon of electromagnetic induction in a conventional transformer, because the vortex field E (r) induction in the space around the transformer is induced regardless of the presence in the same space magnetic fields variable in time H (r), that is, when provided dH / dt = 0. In other words, for any point r of space around the transformer for differential Maxwell's equations, the induction eddy electric field E must be absent. However, the reality of the existence of magnetic fields in electrically sensitive environments (ε0, μ0) for any point in space near the coil primary circuit magnetization is easy to install by placing this space winding magnetizing the second closed circuit. As a result of the magnetic interaction with the primary field in the secondary circuit generates energy, which can be registered. This effect can be used to create a generator with an efficiency of> 100%, working

against all the laws of both classical Maxwell electrodynamics and quantum electrodynamics. More "gratuitous" energy in the generator can be explained by disturbances in the environment between the ferromagnetic cores with windings separated by a relatively small gap of a dielectric material (2-3 mm.). Ferrite cores are placed in the field, enhance the electromagnetic characteristics of the medium (ε, μ). Replacing the ferrite cores on electrical steel cores can enhance the effect in the secondary circuit in the dozens of times, as in the ferrite electromagnetic induction reaches a maximum of 0.4 - 0.5 Tl, and in the electrical steel magnetic flux density is 1.5 -2 Tl and more.

4) The formalism of the field vector potential $\bar{A}$ is well-used to describe the phenomenon of electromagnetic induction current in the conductor of the transformer outside, because outside of the transformer, provided dH / dt = 0 is realized dA / dt ≠ 0 condition. Researcher of the Tomsk Polytechnic University G.V. Nikolaev , using the single-valued magnitude of physical property of vector potential $\bar{A}$ and moving charge e, at (v « c) [3]

$$\bar{\mathbf{A}} = ev/cr, \tag{3}$$

ascertained existence of two types of magnetic fields in the space around it:

$$\text{vector field } \mathbf{H}t = \mathbf{H}^{\perp} = rot\bar{\mathbf{A}} \tag{4}$$

$$\text{scalar field } \mathbf{H}p = \mathbf{H}^{\parallel} = -div\bar{\mathbf{A}} \tag{5}$$

5) Paradoxically, in classical electrodynamics particle can move with a constant acceleration, generating energy from nowhere. It is known that in the case of charged particle movement in plane condenser with the constant tension to be applied classical uniformly accelerated motion $x = \alpha t^2$ appears. If during acceleration of a charge one takes into account force acting on a charge itself, then the braking due to radiation arises. In different works this effect is called in different way: Lorenz frictional force or Plank's radiant friction. That force is proportional to third derivative of coordinate x relative to time and was experimentally proved many years ago. If we write the equations of motion for the charge moving in space free from external fields impact and if the only force acting on the charge is the "Plank radiant friction", then we would obtain following equation:

$$m\frac{d^2x}{dt^2} = \frac{2e^2}{3c^3}\frac{d^3x}{dt^3} \tag{6}$$

It is evident that equation in addition to trivial particular solution v=dx/dt=Const has general solution where particle acceleration is equal:

$$\alpha = \frac{d^2x}{dt^2} = C\exp\left[\frac{3mc^3t}{2e^2}\right] \tag{7}$$

i.e. is not only unequal to zero, but more over it unrestrictedly exponentially increases in time for no reason whatever!!! L.Landau and E.Lifshits in their classical work "Theory of the field" wrote apropos of this: "A question may arise how electrodynamics satisfying energy conservation law is able to give rise to such an absurd result in accordance to which a particle was able to unrestrictedly increase its energy. The background of that trouble is, actually, in infinite electromagnetic "eigen mass" of elementary particles."

In the Unitary Quantum Theory professor L.Sapogin proposed the same solution for the equation with the oscillating charge [9]. Let show that Schroedinger equation has physically similar solution also. Viz., let potential in Schroedinger equation be equal U(x) = rx. Then complete Schroedinger equation is as follows:

$$\frac{\hbar^2}{2m}\frac{d^2\Psi(x,t)}{dx^2} - rx\Psi(x,t) + i\hbar\frac{d\Psi(x,t)}{dt} = 0 \tag{8}$$

We will seek the solution in rather unusual form

$$\Psi(x,t) = b\exp\left(i\frac{m\alpha^2t^3}{2\hbar} - i\frac{m\alpha tx}{\hbar}\right) \tag{9}$$

Bu substituting (9) in (8) we get (after reducing):

$$-2m\alpha^2t^2 + (m\alpha - r)x = 0 \tag{10}$$

This relation will be fulfilled if

$$x = \frac{2m\alpha^2}{m\alpha - r}t^2 \tag{11}$$

If in (11) impose the requirement r →0 (potential vanishes), then absolutely strange particular solution appears where the particle is able to move with constant acceleration and to generate energy no of an unknowns where origin . That effect remains valid even if we put r→0 directly in equation (8);

6) Maxwell himself pointed out the difficulties with his equations to non-closed electric currents and the individual elements of the current. These difficulties lie in the fact that for the open currents alone, non-zero spatial derivative $rot\bar{A} = H$ vector potential $\bar{A}$ cannot determine it completely. It revealed the existence of yet another non-zero spatial derivative $div\bar{A} \neq 0$ of the vector potential $\bar{A}$. In general, the vector potential $\bar{A}$ can be represented as the sum of the potential and vortex components of $\bar{A}t + \bar{A}p$. This current element creates: the vector magnetic field

$$\mathbf{H}t = rot\,\bar{\mathbf{A}}t\,, \tag{12}$$

and the scalar magnetic field

$$\mathbf{H}p = -div\,\bar{\mathbf{A}}p \tag{13}$$

It turns out that an infinitely long current conductor generates a magnetic field Ht, but the current conductor of limited length creates a magnetic field

vector Ht and the scalar magnetic field Hp. Since isolated current element is hard to imagine, since this requires the source and drain of charges, the field configuration is of interest in case of a real closed currents, in particular for this purpose may be a toroid [7].

7) Analyzing the causes of conflict in the modern electrodynamics can note a recognized violation of the third law of Newtonian mechanics allowed by both quantum and classical electrodynamics. This is reflected in the recognition of some of the transverse Lorentz force, with complete disregard for the existence equal to them in size and identical nature of the longitudinal magnetic forces of reaction. From the fact of gross violation of the third law of mechanics in the magnetic interaction of perpendicular elements AC, it follows that, by reason of the principle of superposition, the same gross violation III of mechanics should be expected in the magnetic interaction again perpendicular, but macroscopic current segments that make up the real circuit tokamak .

IV. Correction of Maxwell's Equations of Electrodynamics

Correction of Maxwell's equations of electrodynamics based on the recognition of an additional magnetic field, which creates a force in addition to the transverse Lorentz forces acting along the direction of the current. The expression for the electromagnetic energy flux density (Poynting vector) has the form

$$\mathbf{S} = (\mathbf{E} \times \mathbf{H}r) + (\mathbf{E} \times \mathbf{H}p) \qquad (14)$$

Changing the scalar magnetic field equivalent to the formation of electrical charges, which change in turn generates an electric potential field. The longitudinal wave propagates along the axis toroyda in the tokamak plasma column. Based on experimental results, it is proposed to abandon the Lorentz calibration, but instead take the expression for the electromagnetic energy density in the form [6]:

$$\mathbf{S} = -\operatorname{div} \bar{\mathbf{A}} - \lambda\varepsilon_0\mu_0 \, d\varphi/dt \qquad (15)$$

Obviously, potentials imposed thus allow great flexibility in the use of Maxwell's equations. In the classical case relies S = 0. When using the calibration (15) at λ = 0 we obtain the Coulomb gauge, and at λ = 1 we have the Lorentz gauge. If you do not assume the vanishing of the expression for S, then at λ = 0 the scalar field acquires the meaning of a longitudinal magnetic field. Further transformations are performed in the standard way, with the result that allows to obtain the following system of equations:

$$d\mathbf{E}/dt - \operatorname{rot}\mathbf{H} - \operatorname{grad} \mathbf{S} = 0,$$

$$d\mathbf{H}/dt + \operatorname{rot}\mathbf{E} = 0, \qquad (16)$$

$$\operatorname{div} \mathbf{E} - d\mathbf{S}/dt = 0,$$

$$\operatorname{div} \mathbf{H} = 0$$

For ease of reference the equations (16) Consider the case of absence of currents and charges and accepted $\varepsilon_0 = \mu_0 = 1$.

For clear separation of the concept of a longitudinal wave in a vacuum, and the longitudinal electromagnetic waves that exist in material media, in [7] proposed to call the longitudinal electromagnetic E-wave of a wave, in which the magnetic field is zero, and the vector of the electric field is directed along the propagation direction fluence. This is a scalar function SE // = αE, where α = α (x, y, z, t). Similarly, H is determined by the longitudinal wave generating energy flow SH // = bH.

Differential equations for the generalized electromagnetic field can be derived from the concept of the Poynting vector. Poynting vector for a general electromagnetic waves, including both conventional fashion transverse and longitudinally polarized modes can be represented as:

$$S = E \times H + \alpha E + bH \qquad (17)$$

The corresponding energy density of this vector is expressed as:

$$W = 1/2 \, (E^2 + H^2) + WE// \; + WH// \qquad (18),$$

where WE // and WH // - extra energy.

A rigorous derivation of the additional energy and differential equations for generalized electromagnetic field are given in [7].

Professor V. Aksenov in article [1] offers another modification of Maxwell's equations with non-power electromagnetic fields for the toroidal electrical currents, without taking into displacement currents. The modified equation Aksenov shed light on the skin effect problem in the non-power magnetic fields [1].

V. Experiments

a) Experiment of the Aharonov-Bohm

It is generally accepted that if the magnetic field H is known, there is no need to refer to "formal" vector potential Ā. However, the mere fact that the Schrödinger wave equation appears only vector potential was obvious since the inception of this equation. Unsuccessful attempts to replace the vector potential Ā in the equations of quantum mechanics "physical" magnetic field H is said that the wave function of any moving charge in the field of the vector potential Ā, should reflect the existence of a quite tangible interaction between a moving charge with this field. This interaction can be characterized by the magnitude of potential Ā change and the wave function. In 1956. in quantum physics has been demonstrated simple

experiment, the result of which is known as the Aharonov -Boma [4]. When an electron moves along the long solenoid with a current, the electron trajectory is changing, although the magnetic field outside the solenoid is zero (B = 0). Aharonov-Bohm effect has several explanations [1,3,4]. Feynman explains the effect of the interaction of the particles with the vector potential $\bar{A}$ [4], while Nikolaev and V.Aksenov suggest that the particle interacts with the magnetic field. In electrodynamics Nikolaev particle interacts with a new longitudinal scalar magnetic field $H_{\parallel}$ [3], in theory, toroidal and poloidal magnetic fields V.Aksenov particle interacts with the non-force toroidal magnetic field Ht [1]. In theory, Nikolaev scalar magnetic field generated by currents of displacement, in theory Aksenov non-force magnetic field is generated by the displacement currents occurring between the plates of the capacitor and conduction currents. The experimentally observed phenomenon of the power of moving electrons interact with the field of the vector potential $\bar{A}$ in the experiments of the Aharonov-Bohm effect, was confirmed in later experiments by Japanese scientists (1984) [5]. During experiments, it was found change in the phase of the wave function of a moving charge in the absence and presence in the test area of the vector potential field $\bar{A}$, the complete absence in this area of the magnetic field H. The positive results of experiments matched only unique value of the vector potential $\bar{A}$, is compared with the same parameters unambiguous elemental power. Changing the phase of the wave function of the vector potential $\bar{A}$ is given by:

$$\Delta\varphi = q / \hbar \int \bar{A} ds, \qquad (19)$$

where the integral is taken along the particle's trajectory. Experimental discovery of the phenomenon of longitudinal force effect of interaction along the axis of current toroid of electrons with the field of vector potential $\bar{A}$ in the experiments of Aharonov-Bohm make one revise the well-established view about the transverse magnetic Lorentz forces alone and accept the presence of longitudinal forces of magnetic interaction.

b) The cathode-ray tube with a toroidal winding (A.Kostin's experiments)

To demonstrate the phenomenon of moving charge interaction with the field vector potential A at the cathode-ray tube 1, at the location of the deflecting plates 2, 3. wearing toroidal coil toroidal winding made of outer and inner layers of wound copper wire of 0.62 mm with a total of 500 turns. the need for a two-layer winding caused by the fact, to prevent the magnetic field of the ring current (one left-winding spiral, the other - the right-helical). The windings are connected so that their magnetic fluxes summed. The electrons are accelerated in the tube potential difference 400V. On the vertical plate was fed a constant deflection voltage to set the on-screen (5-20 mm) of the electron beam of the base offset. The current in the coil was varied 0-5A. The experimental results are plotted. As the current increases in one direction of the electron beam deflection angle increases in magnitude relative to the reference deviation. Increasing the angle of deflection of the electron beam at a constant voltage across the deflection plates is due to a decrease in the electron beam velocity due to their interaction with the field of the vector potential A toroidal winding. When the current in the coil on the back, the electron beam deflection angle decreases its value in relation to its baseline deviation, registering the effect of increasing the speed of the electron beam in their interaction with the field of the vector potential A toroidal winding.

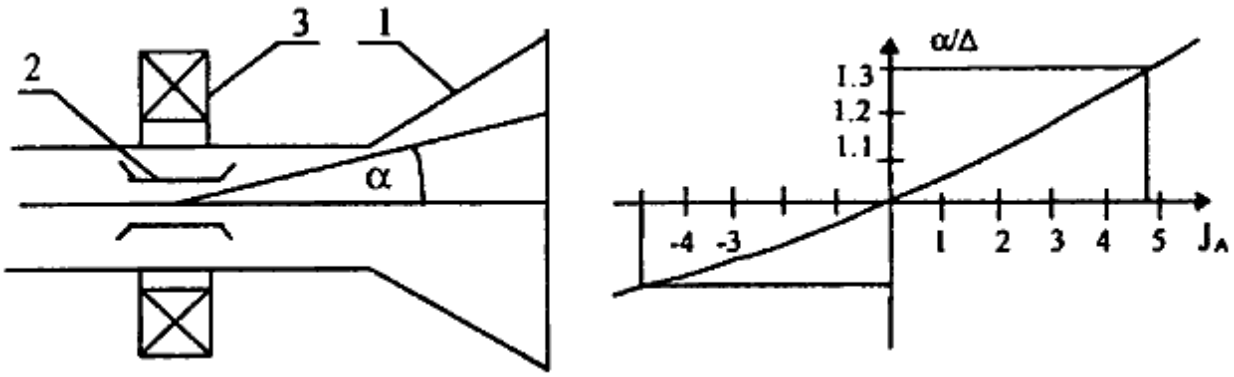

Figure 4: Cathode-ray tube with a toroidal winding

Thus, the results clearly prove the existence of a conventional classical analogue of the well-known experience of the Aharonov-Bohm and confirm the existence of a previously unknown phenomenon in the science of the longitudinal magnetic interaction [3]. Not paying attention to the new scalar magnetic field $H_{\parallel}$ = - $div\bar{A}$ and related new longitudinal magnetic interactions science cannot provide a sufficiently reliable theory of electrodynamics of charged particle accelerators and collider. The phenomenon of longitudinal magnetic interaction present in the accelerator in the form effect of longitudinal instability of accelerated charged

particles, it is experimentally proven fact. An example of this can serve as a spurious "edge effects" longitudinal induction currents in the conductive medium in the MHD- generator.

VI. Calculation of Energy Accelerators

The problem of the interaction of the space environment with electromagnetic energy of the moving charge, and replacement of the controversial idea of increasing the mass of the moving charge to infinity when approaching the speed of light, a more acceptable from a physical point of view of understanding of the deformation of the electric field of a moving charge and reduced to zero the force of interaction with him. The initial energy of the electric field of a stationary charge is reduced when driving this charge in the amount of energy detected magnetic field, ie the magnetic energy in the environment around a moving charge does not appear, as is commonly believed, and extracted from it. The initial energy of the electric field of a stationary charge W_{E0} decreases when moving this charge an amount equal to the complete energy of the detected magnetic field $Hc=(v/c)E$. Interaction of electric charge e and the electric field E0 is, given the retarded potentials and distortion of the electric field E of the moving charge, It is described by the dependence [3]:

$$F = E_0 q\sqrt{1-v^2/c^2} \qquad (20)$$

Taking into account the mass of the charge and acceleration α, the dependence (20) can be written in the form:

$$F = E_0 q\sqrt{1-v^2/c^2} = m_v\alpha = \frac{m\alpha}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (21)$$

Within the framework of the relativistic concepts of modern electrodynamics dependence (21) is interpreted as the effect of "increasing the mass" m0 moving charge to infinity when approaching the speed of motion of the charge to the speed of light. However, equation (21) is a relativistic effect of reducing the force interaction of the moving charge with the electric field E0, formed by a stationary charge. The effects of delayed potentials and deformation of the electric field of moving charges leads to a restriction of the growth of the mass of the charge, at $v\rightarrow c$. The increase in particle mass at a rate occurs for other reasons (non-relativistic effect). Structural elements the dipoles (virtual electrons and positrons) of the ether (r, dr), including the charge eo as well as electromagnetic parameters of the ether - εo, μo, allow us to determine Planck's constant [11]:

$$h = 2\pi eo \ \frac{r}{dr} \ \sqrt{\frac{\mu o}{\varepsilon o}} \qquad (22)$$

where μo - magnetic permeability;
εo - dielectric constant;
r - the size of a structural element of the dipole of the ether $r = 1.3988\cdot10^{-15}$ m;
dr - the ultimate deformation of the dipole (destruction limit) $dr = 1.0207\cdot10^{-17}$m.

Planck's constant $h = 6.6260\cdot 10^{-34}$ (joule · s) completely depends on the characteristics of ether.

This implies that the de Broglie formula that sets a connection between the wavelength (λ) of any particle and its momentum (mV)

$$\lambda = h / mv \qquad (23)$$

where h is Planck's constant;
m is a particle mass;
v is a particle speed;
also depends on the features of the environment and the momentum of the particle. The momentum belongs to the particle, while transverse oscillations (electro elastic deformation of bound charges) appear in the environment when the particle moves with speed V - this is a trace of the particle in the environment. A screw type sinuous oscillatory motion of particles is so-called uncertainty of particles Heisenberg's trajectories. When the oscillation frequency of the electromagnetic field that occurs when a particle moves in the ethers $\omega_B = \frac{mv^2}{\hbar}$, close to the natural frequency of oscillation of the particle $\omega_S = \frac{mc^2}{\hbar}$, resonance occurs. Resonance is accompanied by an increase in the additional mass of the particle:

$$\Delta m = \hbar\, \omega s / c^2 \qquad (24)$$

The standard graph of the dependence of the particle's mass on its speed is now simply half the amplitude-frequency characteristic of the forced oscillations of a harmonic oscillator with no dissipation, and the mass growth is absolute [9].

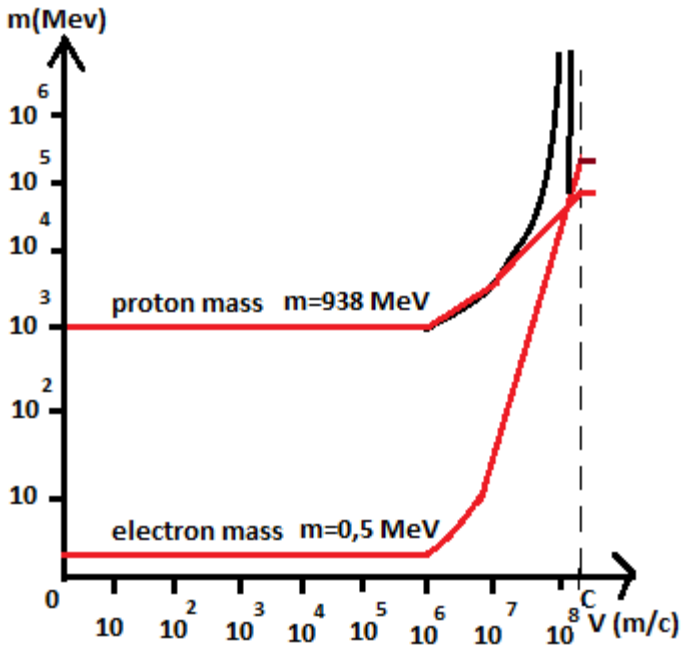

Figure 5

The standard graph of the dependence of the particle's mass on its speed at v→**c**
Red color denotes the resonance dependence of the particle's mass at v→**c**
Black color denotes the relativistic dependence of particle's mass at v→**c**.

The frequency corresponding to the resonance energy of the electron (**ν**) at v→**c** and wavelength (**λ**), and the precession frequency of the rod vortex dipole dark energy (**ω**) (electron - positron) define as the frequency of the wave function of Schrödinger and de Broglie (at resonance they describe the same probability density of finding a particle at any point in space):

$$\nu = W / h \text{ or } \quad \omega = W / \hbar \quad \text{and} \quad \lambda = 2\pi s / \omega$$

where W - the photon energy
h - Planck constant h = 6.6260 · 10^{-34} J / Hz
ħ = h / (2π) ħ = 1,0546 · 10^{-34} J / Hz
c - the speed of light c = 299792458 m / s

The maximum increase in the electron's mass at v → C takes place at resonance (ω_r= 3•10^{25} Hz) and exceeds the electron's mass (their number) at energy 1 MeV ≈10^5 times [8].

It turns out that the energy calculation accelerators fundamentally not true? It was assumed that the "relativistic" increasing the mass of charged particles determine by the equation:

$$m_v = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (25)$$

Accordingly, the kinetic energy of charged particles is:

$$W = \frac{mc^2}{2} \qquad (26)$$

Due to the fact that in formulas (21 and 25), the mass m and charge q are inversely proportional to each other, both formulas describe law the same motion of a charged particle. But the difference here is obtained in principle, which directly affects the energy calculations accelerators. For example, the maximum kinetic energy of the electron is equal to 0.26 MeV ($W_e = \frac{m_e c^2}{2}$). By increasing the energy of an electron in an accelerator to 0.5 MeV, its mass should increase about 2 times, while increasing the power up to 10 MeV, its mass should increase by 28 times. If the increase in mass of an electron from the particle velocity is determined by the other law, and has a limit associated with the natural frequency of the particle, the growth the electron energy will also stop at this limit. In this case, the amplifier consumes no energy to increase the mass and thus the electron energy. The amplifier uses energy to compensate for the reduction of the charge. Accordingly, the maximum proton energy is 500 MeV, or 0.5 GeV and create accelerators with energies of 200GeV or 1000 GeV is a difficult task.

Changes of the mass and charge of the particles at v→**c**, as well as the deformation of the electric field of a moving charge requires further experimental study and corrections the theory accelerators and colliders. The real energy of the protons in opposite flows in the collider should be much less than stated, and the processes of birth of new particles in the collision of protons differ from those predicted theoretically. It should be noted that the acceleration of charged particles to "relativistic speeds ", at v → c, gives an interesting and very important effect. The fact is that under such speeds, particles (eg, protons) loses its charge, becomes quasi-neutral and can freely penetrate into matter the target, to overcome

the Coulomb barrier energy. Thus, the particles can initiate nuclear reactions such as the synthesis of heavy elements. An even greater extent this applies to the accelerator opposite flows (colliders), when the colliding particles are quasi-neutral and a potential barrier is virtually absent.

VII. Conclusion

In conclusion, it should be noted that, in spite of the attractiveness of the idea of a man-made sun - a source of unlimited energy, the construction of large power fusion reactors based on the tokamak involves great risk. These risks are caused not only by the lack of a full-fledged theory of electrodynamics that can adequately describe the actual behavior of electric and magnetic fields and currents in a tokamak, but the study of natural fusion reactor, which acts as our sun. Regular solar plasma emissions could destroy all life on our planet, if not for the distance of the Earth, its thick atmosphere and magnetic field. For man-made fusion reactors in the world, protection from such plasma emission is very difficult to create and control the fusion processes in tokamaks is questionable. Each program of nuclear fusion has adjective "controlled", but as a matter of fact there is no control at all. The initial quantity of respondent material is simply very small quite providently we should say. In spite of successes achieved, the head of such a group in England d-r Alan Hibson announces few years ago that not less than 50 should pass before the construction of reactor for demonstration can be ready. Today that point of view becomes generally accepted. Straightforward approach to nuclear fusion used by modern science is absolutely natural because there is no method in the standard quantum mechanics to influence that process. The future of systems of really controlled nuclear fusion will possibly lie not on the path of the primitive and meaningless heating and pressing of the respondent material but on the path leading to the collision of nuclei possessing a small energy and micro adjusted wave function phase. That is possible in principle by the superposition of controlling external electromagnetic field on the reactive system containing order atoms of deuterium and free deuterons. The special atomic lattice geometry may produce the same characteristics. Dispersion of a deuterons flow due to diffraction on such lattice will result in automatic selection of deuterons in energies and phases. In future models of the reactors in contrast to all existing projects will react in any moment of time only the smallest part of deuterons automatically selected relative to initial phases. It could be possible to obtain in result the small energy generating during long period of time until the reserve of light reacting nuclei will not be exhausted. That cold nuclear fusion does have the right to be called "controlled" [9]. Found A.Penziaom and R. Wilson thermal background radiation of the universe in the microwave range 10 GHz - 33GGts, made unreasonably received in astrophysics called "relic". It can be a process of cold fusion occurring in the space environment from the release of energy sufficient to raise the temperature of the universe to 2,7K. Nuclear fusion occurs when a charged particle overcomes the repulsive Coulomb barrier and enters the region the nuclear forces of attraction. To implement tunneling, a particle must approach the potential barrier in the phase when the amplitude of the wave packet is small and the particle in the absence of the charge overcomes the barrier, "not noticing" it. In another phase, when the amplitude of the wave packet is large, nonlinear interaction begins and the particle can be reflected from the barrier. From the standpoint of the Unitary Quantum Theory (UQT) Professor L.Sapogina motion of electrons in the tunnel junctions may occur even at very low temperatures [9]. This is confirmed by the experiments of American scientists, who managed to fix the tunnel junctions near the absolute zero of temperature (in liquid helium). [10] Based on the equation UQT Sapogin possible to determine the optimal conditions for the realization of nuclear fusion processes at sufficiently low temperatures. In nuclear reactors of the future the question of magnetic confinement of hot plasma will be no longer relevant. Nature is inexhaustible, it offers a variety of options for power generation, it is fusion reactors stars and cold fusion with the release of subtle heat in outer space of the universe, the choice of the man.

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