Resonance Scattering in an Intergalactic Medium

Stanislav Konstantinov

Department of Physical Electronics, Russian State Pedagogical University, St.Petersburg, RSC"Energy", Russia.

*Corresponding Author: **Stanislav Konstantinov,** *Department of Physical Electronics, Russian State Pedagogical University, St.Petersburg, RSC"Energy", Russia.*

Abstract: *In the article it is proposed to expand the framework of the standard model ΛCDM (Λ-Cold Dark Matter) and, in addition to the model of inelastic interactions of the protons of the radiation belt and cosmic radiation with the nuclei of atoms of the residual atmosphere, to consider the resonant mechanism of generation of secondary electrons and positrons in the near-Earth space environment. Experiments PAMELA, FERMI and AMS give the researcher a unique opportunity to simultaneously measure secondary electron and positron fluxes, which is extremely important for the development of a standard model for the generation and distribution of cosmic rays. An analysis of the data of these experiments confirms the conclusion about the resonant character of the process of generation of secondary electrons and positrons in the cosmic medium*

Keywords: *physical vacuum; electron; positron; proton; resonance*

1. INTRODUCTION

The object of my research is the intergalactic medium (physical vacuum), which represents the conceptual basis of the universe and takes part in all interactions in nature. The standard ΛCDM (Λ-Cold Dark Matter) cosmological model should be revised in the light of the analysis of new experimental data, and the simple minimal expansion of the Standard Model (SM) called SMASH, proposed by Dr G. Ballesteros of the University of Paris-Saclay France, is clearly not enough [1]. The Leo Sapogin's Unitary Quantum Theory (UQT) [2] and the Yuri Baurov's Theory of the byuon [3] substantially supplements SM. Non-baryonic matter, which forms the basis of the intergalactic medium, is in constant force interaction with the baryonic substance of planets and stars that is born from it. This non-baryonic matter is the main source of energy for the formation in them not only of electron-positron pairs, but also of any other structural elements of matter. Moreover, possessing an all-pervasive character, this medium influences all processes occurring in accelerators, colliders, Cherenkov generators and other vacuum installations on Earth and in the Cosmos. A new theory of intergalactic plasma is born at the junction of the three directions of physics: elementary particle physics, quantum electrodynamics (QED), and astrophysics. Only the joint work of scientists from all fields of physics will be able to solve this problem. It is necessary to combine the studies of the mechanism of resonant generation of electron-positron pairs in a physical vacuum irrespective of the nature of its excitation (photons of cosmic radiation, relativistic electrons and protons or a peak electric field) in the near-Earth space environment, Cherenkov generators, tokamaks, accelerators and colliders or in the EmDrive engine. This idea is the basis of my appeal to readers in the article "Dark matter and Generation of secondary electrons and positrons in the near-Earth space environment from the data of experiments PAMELA, FERMI and AMS" [4].

2. THE MECHANISM OF RESONANCE INTERACTION OF PARTICLES IN LARGE-SCALE POINCARE SYSTEMS (LPS)

Tesla's theory of global resonance [5], subsequently elaborated by Nobel Prize winner I. Prigozhin [6], professors A. Rykov [7] and D. Trubetskov [8], allows us to see how virtual electrons in the cosmic medium change to real particles. The space environment is a global field of oscillators' super-positions with the continuum of frequencies. In contrast to the field, a particle oscillates with the same fixed frequency. In front of us, there is an example of the non-integrable Poincare system. Resonances will occur whenever the frequency of the field and the particle are several-fold. The evolution of dynamical systems (field-particle) up to the self-organized matter depends on available resonances

between degrees of freedom. This was a conclusion by I. Prigogine and I. Stengers in their monograph the Time, Chaos, Quantum [6]. They revived an idea by N. Tesla on a theory of global resonance. Nevertheless, if the Tesla's resonance theory of the matter birth in the Aether had been based on an intuition of the ingenious experimenter, then in case of I. Prigogine, this theory acquired rigorous mathematical view. Proved by Poincare non-integrable dynamical systems and the theory of resonant trajectories by Kolmogorov-Arnold-Moser allowed Prigogine to conclude that the mechanism of resonance interaction of particles in large-scale Poincare systems (LPS) was "essentially" probable (binding). With increasing communication parameters, there is an increase in likelihood of resonance outcomes. It is such LPS dynamic systems, to which systems of particle interaction with the space environment and with each other belong. I. Prigogine wrote, "Should the systems be integrable, then for coherence and self-actualisation there would be simply no place as all dynamic movements would essentially be isomorphic movements of free (non-interacting) particles. Fortunately, the LPS in nature prevail over other syste." [6]. According to L. Sapogin's UQT, the electron as a real-world wave packet is described by the structure function, and maybe, through the transformations of the Fourier series, decomposition into flat sinusoidal waves. The structural function in the UQT is represented as a function of the amplitude of the harmonic components depending on frequency (spectral representation). In the UQT, the quantum packet becomes classical with an increase in its mass at the resonance of a large number of wave packets, and the quantization of masses arises in a delicate balance between dispersion and non-linearity. The particle moves according to classical laws of motion, while each packet is governed by quantum laws. [2]. In the general case, unusual real particle changes are possible in a nonlinear oscillator even with sinusoidal external force applied. The system behavior can be very irregular and almost sporadic to the extent of dynamic stochasticity. The average motion with isolated nonlinear resonance is similar to electron behavior in a potential well. Multiple resonances correspond to multiple potential wells. Overlapping resonance is indicative of a convergence of adjacent wells with the system moving back and forth or, under certain conditions, leaving the wells. In this case, nonlinear systems will exhibit a new instability type, the stochastic instability [8]. Let us take a second look at the mechanism. In the case of a linear oscillator, one can manage with the first term of the expression $\omega^2(x) = \omega^2 o\ \alpha h\ + + ... \beta h^2$ for square natural frequency of the power series in oscillation amplitude, and the only fundamental effect observed when external force is applied is linear response. In this case, the smaller the oscillator loss, the sharper and higher the resonance curve. What happens if the oscillation frequency depends on the amplitude? Assume that the stress frequency is as great as the rotation frequency in one off-center phase path. The system will then draw energy from the outside and the initial low oscillations will grow. The particle will therefore gradually move to higher-energy phase paths but the frequency will be higher there as the oscillator is non-isochronous. As a result, the system runs out of resonance to the point where the oscillator ceases to respond to external force. This is due to nonlinear shift $\omega = \omega(x)$. Consider now the case of a nonlinear oscillator. In a linear oscillator, resonance only occurs at a frequency close intrinsic, i.e, $\Omega = \omega o \pm \varepsilon$, where ε is a small addition. A nonlinear oscillator also exhibits harmonic resonance; e.g. quadratic nonlinearity activates spectral components 2Ω, 4Ω, etc. (anharmonicity of vibrations). So with e.g. $2\Omega = \omega o$, the system will respond to harmonic external force and develop a dynamic stochasticity. Whereas particle behavior in an oscillator is generally interpreted as fully deterministic, with its past and future explicitly determined by equations of motion in initial conditions, stochasticity is associated with randomness and ambiguity. Could a strictly deterministic process also appear as random? L.Sapogin in his UQT answers in the affirmative. His physical and mathematical investigations demonstrate that it is possible and, in some cases, inevitable. The autonomous movement equation in the case of a potential well in the shape of hyperbolic secant $U(x) = -Uo\ \text{sech}(x^2)$, will look as follows:

$$m\frac{d^2x}{dt^2} + 4UoQx\frac{\cos^2\left(mx\frac{dx}{dt}+\varphi o\right)\sinh\left(x^2\right)}{\cosh^2(x^2)} = 0 \qquad (1)$$

Where t, m, Q, φ are time, mass, charge and initial phase of a particle respectively. The resulting modes of the particle's behavior under equal conditions greatly depend on the initial phase, and its variations result in a very rich behavior [2]. Notice that non-isochronism is essential for dynamic stochastic systems without dissipation. Indeed the increase or decrease in fluctuation energy due to perturbation is phase-dependent. The phase, in turn, depends on the frequency changing in disturbed conditions because of the isochronism. The system can get out of a single resonance, but

with multiple (more than one) resonances the system behavior pattern is complicated by their interactions. So, depending on the disturbance phase, the system can either proceed to the next resonance region, eventually leaving the well, or turn back. This state is referred to as the "overlapping resonances" [8].

The resonant nature of the pairs of elementary particles under the influence of external radiation is a fundamental process of the Universe. Direct experimental determination of the resonance dependence of birth N elementary particle pairs on of frequency ν is almost completely silenced by modern physics. Following the deceptive logic of the modern theory, this dependence is drawn as a monotonically increasing curve.

3. DATA OF EXPERIMENTS PAMELA, FERMI AND AMS

Experiments PAMELA, FERMI and AMS give the researcher a unique opportunity to simultaneously measure secondary electron and positron fluxes, which is extremely important for the development of a standard model for the generation and distribution of cosmic rays. An analysis of the data of these experiments confirms the conclusion about the resonant character of the process of generation of secondary electrons and positrons in the cosmic medium [4]. The resonant maximum of the total spectrum of electrons and positrons at an external radiation energy Wp ≈ 20 GeV was detected by Yu.V. Galaktionov during its accurate measurements in the detector AMS experiment at the International Space Station [8, Fig. 16]. The maximum of the total flux of electrons and positrons at the photon energy Wp ≈20 GeV corresponds to the resonant frequency of the structural element of the cosmic medium (quantum physical vacuum) $\nu_r = 4.6911 \cdot 10^{24}$ Hz obtained by professor A.V. Rykov based on the parameters of the structural element of the cosmic medium (physical vacuum), including the charge of the dipole , as well as its electromagnetic parameters μ_o (magnetic permeability) and ε_o (dielectric constant) as early as 2000. [5] According to Rykov, with the size of the structural element of the cosmic medium dipole r = 1.3988 $\cdot 10^{-15}$ m, the ultimate deformation (destruction boundary) dr = 1.0207 $\cdot 10^{-17}$ m. is related by the relation dr = α r, where α = 0.0072975 is the fine structure constant. Destruction boundary corresponds to the external photon energy W $\geq$ 1 MeV (the initial boundary of the photoelectric effect in the physical vacuum. The photon frequency $\nu_i = 2.4891 \cdot 10^{20}$ Hz). The deformation in physical vacuum is less than dr should be of an electroelastic character, and at higher values, deformation leads to the destruction of the dipole and to the creation of an electron-positron pair. If, however, the "PAMELA effect" (the increase in the relative fraction of positrons in the total flux of positrons and electrons in the cosmic medium, starting with a photon energy above 5 GeV up to 200 GeV) actually exists, this means the presence of a second resonant maximum for positrons at W_r = 200 GeV [4]. Perhaps the space environment exists in near-Earth space in two states (conditionally call them dark matter and dark energy). Analysis of the resonance curves shown in Fig. 1 and Fig 16 [9] allows to determine the photon frequency corresponding to the natural frequency of the structural element of the space medium (physical vacuum) and its wavelength. The frequency corresponding to the resonance energy of the photon (ν) and the natural frequency of the structural element of the cosmic medium (physical vacuum) is defined as the frequency of the Schrodinger and de Broglie wave functions (for resonance, they describe the same probability density for finding the particle at any point in space):

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

Where W - the photon energy

h - Planck constant h = 6.6260 $\cdot 10^{-34}$ J / Hz

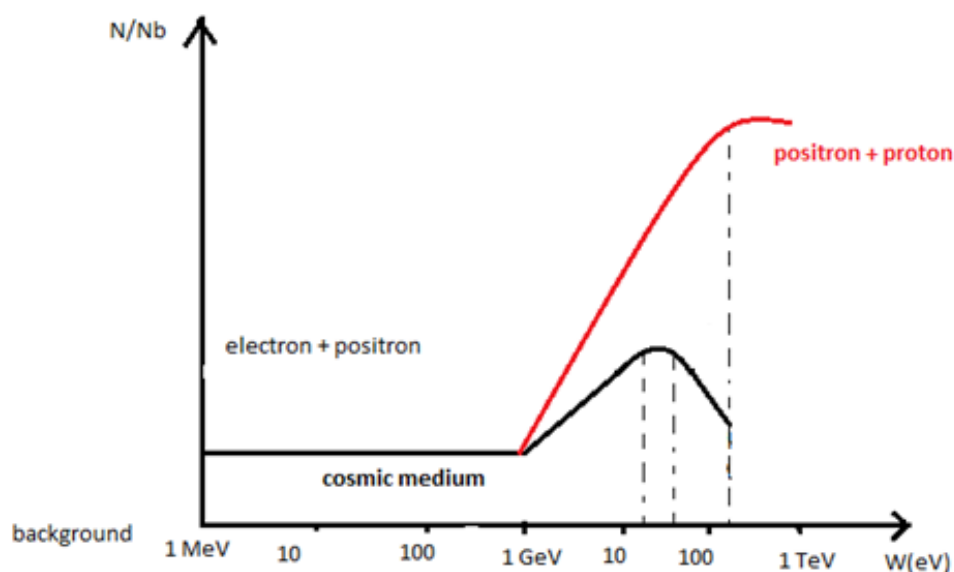$\hbar = h / (2\pi)$ $\hbar$ = 1,0546 $\cdot 10^{-34}$ J / Hz

c - the speed of light c = 299792458 m / s

Thus, it is possible to determine the resonant frequency of generation of secondary electrons and positrons for two states of near-Earth space environment (dark matter and dark energy) and wavelength [11]:

$W_r \approx$ 20 GeV = 33 $\cdot 10^{-10}$J, ν_r = 4.7 $\cdot 10^{24}$ Hz, ω_r = 2.82 $\cdot 10^{25}$ Hz, λ_r = 6.39 $\cdot 10^{-17}$ m

$W_r{'} \approx$ 200GeV = 330 $\cdot 10^{-10}$ J, $\nu_r{'}$ = 4.78 $\cdot 10^{25}$ Hz, $\omega_r{'}$ = 28.2 $\cdot 10^{25}$ Hz, $\lambda_r{'}$ = 0.6 $\cdot 10^{-17}$ m

Figure1. *Graph of resonance curves of generation of secondary electrons and positrons*

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4. THE PHYSICAL VACUUM IS AN THE SOURCE OF CONCEPTUAL INNOVATION

The biggest mistake in the Einstein's relativistic theory is that it ignores the contribution of the space environment in the energy balance of the laws of conservation of energy and momentum. In the article "Experimental relativity violations of the principles of equivalence and conservation of energy," the famous physicist Professor Stefan Marinov wrote: "Did you know that relativism (SRT and GRT) are not true science? - True science necessarily rests on causality and the laws of nature, given to us in physical phenomena (facts). In contrast to this SRT and GRT are constructed on axiomatic postulates, that is fundamentally unprovable dogma, in which followers must believe these teachings." The nature of Casimir forces, longitudinal forces of magnetic interaction, effect Lamb - Rutherford shift of the spectral lines of the hydrogen atoms and the other effects of the physical vacuum. Active influence on the system from the o space environment occurs when the dominant processes in the system are irreversible. The validity of this assertion is confirmed in the microcosm and in the macrocosm, and even in the cosmology of the universe. V.Rubakov, a member of the Russian Academy of Sciences, writes: "The universe expands, but energy thickness is constant. Volume increases and the energy in that volume increases, too. Where does it come from? Nowhere, no law of conservation of energy" [10]. Latent energy the Universe becomes apparent in the course of the perturbation of the physical vacuum, in moments the birth of matter, in moments accelerate its movement. The recognition of the existence inhomogeneous space environment with positive density (physical ether instead of physical vacuum), opens to mankind an inexhaustible source of conceptual innovation in all areas of activity. Instantaneous transmission of the information and energy to anywhere in the Solar System, gravity control, generating unlimited amounts of electrical energy at subatomic level, fundamentally new electric motors - all these do not make a complete list of innovations implemented using the physical vacuum. Formal science had not recognised new physical devices; nevertheless, many of those projects have been already in a stage of their technological implementation. On the basis of cosmic energy have been created and have found practical application of such devices as microwave Roger Shawyer engine Em Drive, Baurov's engine and Leonov's anti-gravity quantum engine , the Andrea Rossi reactor E-cat, the Paul Bauman generator "Testatik machine M / L Converter", the Leo Sapogin's New Source of Energy, G. Shipov's Torsion transmitting devices, "The Global System to Transmit Energy" wirelessly project, in part implemented by N. Tesla in 1908 in his laboratory on Long Island near New York and others. It should be noted that the principle of operation of those devices not inconsistent the physical laws of conservation of energy and momentum, even if their efficiency ≥100%, because the system open to communicate with the space environment (physical vacuum).

5. MY EXPERIMENTS

In 1969-1971, being a post-graduate student of the Russian State Pedagogical University, St. Petersburg, Department of Physical Electronics I dealt with the phenomenon of secondary electron emission. During the work I paid attention to the imperfection of Maxwell's theory of electrodynamics and quantum electrodynamics and discovered the effect of unexplained energy growth of clusters of secondary electrons. The composition of my vacuum installation for the investigation of secondary electron emission included:

1. The spherical condenser was a glass flask 0.4 m in diameter with a metal layer applied to the flask wall connected to electrodes soldered to the walls of the flask. Inside the flask, a deep vacuum was created with the aid of vacuum pumps;

2. A metal target placed in the center of the sphere;

3. An electron gun capable of generating primary electrons by heating a spiral, focusing them into a narrow beam and directing it to a target, giving them a predetermined energy (relativistic velocity).

Secondary electrons were generated by impact and deceleration of primary electrons in the target and recorded on the inner walls of a spherical capacitor. Between the target and the metal layer on the walls of the spherical capacitor, a predetermined potential difference was established. The Studies of secondary electron emission were carried out under conditions of deep vacuum. In the case of secondary emission, the electrons emitted from the target have are approximately evenly distributed initial phase, since secondary current caused by electrons having a kinetic energy larger than the height of the potential barrier (output work). The existence of a large number of electrons with the same phase facilitates the formation of clusters. It should be noted that the emergence of excess energy clusters and their discovery due to the fact that in contrast to the increase in the energy of a single electron, clusters of electrons experimental easier to register growth of energy and reliably separate them from the primary electrons. These clusters acquire during acceleration an energy that in tens of times the calculated value of the energy of charge for a given potential difference.

A similar effect of excess energy generation during the acceleration of charged clusters, which appear on pointed cathodes with large currents of autoelectronic emission. The first research in this sphere was started by Kenneth Shoulders. In Russia, these studies were conducted by Academician G.A. Month in 1966. These researchers discovered two extremely interesting facts:

1.Electron current is generated by sufficiently stable electron clusters consisting of 10^{11} electrons with a size of the order of 20 microns.

2. These clusters acquire during acceleration an energy, which exceeds by 30 and more times the value possible when the charge passes the used potential difference.

These phenomena (especially the second one) are absolutely incomprehensible from the point of view of the ordinary physics.

Paradoxically, in classical electrodynamics particle can move with a constant acceleration, generating energy from nowhere [2]. 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:

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

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

$$\alpha = \frac{d^2x}{dt^2} = C\exp\left[\frac{3mc^3t}{2e^2}\right] \tag{4}$$

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." This explanation did not satisfy me. However, these effects contradicted Einstein's dominant theory, and my scientific work was not recognized by my scientific supervisor. In my further 25-year practical work as the head of the group and the scientific consultant in the RSC Energia, I have repeatedly encountered phenomena that do not fit into the framework of SRT and GTR Einstein, but only now at the age of 75 I was able to sum up my observations.

6. CONCLUSION

Modern of the state of theoretical physics and cosmology allows us to state that physics is not ready for the new realities of the 21st century. The standard model ΛCDM should be revised in the light of the latest discoveries of astrophysics related to the effect of accelerated expansion of the universe and the nature of non-baryonic matter (dark matter and dark energy), which accounts for 95% of average density of matter in the Universe. Analyzing the situation, we must admit that the true reason for this is the refusal by astrophysics to recognize the possibility of a constant force interaction between dark matter and dark energy with baryonic matter of planets and stars that are born from the intergalactic medium. Successful tests of the EmDrive engine, Y. Baurov's quantum engine and V. Leonov's antigravity engine, the long-term work of the Paul Bauman constant current generator, N. Tesla's wireless energy transfer system is a crushing blow to the modern scientific paradigm, which brought to a crisis of theoretical physics.

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