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Research of global anisotropy of physical space based on investigation of changes in β and α-decay rate of radioactive elements, motion of pulsars and anisotropy of cosmic rays

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Abstract: Results from experimental studies of a global anisotropy of physical space and new interaction in nature based on analyzing fluctuations in the intensity of the β and α-decay of radioactive elements, motion of pulsars and anisotropy of cosmic rays, are presented. The explanation of the results, based on a hypothesis as to the global anisotropy of physical space caused by the existence of cosmological vector potential A_G in limits of theory of byuon, is given. It is shown that vector A_G has the following coordinates in the second equatorial coordinate system: right ascension α = 300° ± 10°; declination δ = 36° ± 10°.

Keywords: Changes In β and α -Decay Rate of Radioactive Elements, Global Anisotropy, New Force, Motion of Pulsars, Anisotropy of Cosmic Rays

1. Introduction

It was shown in [1–5] that with extraordinary variance in the action of a system of spinor and boson fields interacting with an electromagnetic field, the potentials of physical fields that are non-measurable from the standpoint of gauge theories, become unambiguous and measurable quantities within the space under study, due to violation of the gauge invariance within the area of electric charge variation. The variance is unusual in that the speed of interaction propagation $C(x, t)$, where x is a certain space coordinate and t is time, is assumed to be a generalized coordinate, and it is believed that electric charge $e = e\{C(x, t)\}$ and the static properties of the fields are fixed. One of the main results of these works is that the expressions obtained for elementary particle masses appear to be proportional to the modulus of a certain vector potential. In this work, this potential is referred to as the cosmological vector potential A_g[5], and it is assumed that if in any area the vector potential of any magnetic system has a component in the direction opposite the vector, then any matter in the area will be ejected from it. The new force has nonlinear and nonlocal behavior, depending on the changes in a particular total potential $A_\Sigma(|A_\Sigma|\leq|A_g|)$, and can be represented by a particular series in terms of ΔA_Σ [5]. Here the first term of the series is $\Delta A_\Sigma\cdot\partial\Delta A_\Sigma/\partial x$, where x is the space coordinate in the three dimensional space R_3. Analysis of this series term was the basis for many of the experiments discussed [6-8]. The new force was investigated from 1987 to 1994 at experimental facilities of the Kurchatov Institute of Atomic Energy (KIAE) and the General Physics Institute (GPI) of the Russian Academy of Sciences [6–8] using high current magnets equipped with torsion and piezoresonance balances. The analysis of these experiments created a theory of byuon [5, 9].

That is a theory of “life” of special discrete objects (byuons) from which the surrounding space and the world of elementary particles form (The previous name was “one-dimensinal discrete magnetic fluxes”.See an explanation of new name in [5]). This theory created a base for this new force of nature.

Results from experimental investigations of the new force's characteristics using two different systems were considered in [5, 9, 10]: one and two Sodin high precision quartz gravimeters at GAISh (Moscow State University), and a system of two quartz resonators [9]. Results from experimental studies of the luminosity of plasma created by the pulsed plasmatron in dependence on the position of its axis with respect to ambient space are presented in [9, 11]. It was shown in these experiments that the spatial distribution of the plasma emission intensity is of an explicitly anisotropic nature; i.e., a certain cone of plasmatron axis directions with an aperture on the order of 90°–110° is observed, along the generatrices of which the plasma emission reaches its maximum values. It was shown moreover that the vector directed along the axis of the indicated cone had the following coordinates in the second equatorial coordinate system: right ascension $\alpha = 293° \pm 10°$ and declination $\delta = 36° \pm 10°$. The results of these experiments agree with earlier experiments [5 - 10] aimed to determine the direction of vector A_g, and are the most precise until 2011.

The cycle of investigations into the impact of the new force on the rate of β-decay of radioactive elements is exposed in [5, 9, 12 - 17].

In classic nuclear physics the β and α – decays of radioactive elements are usually thought to be purely random processes practically not subjected to exterior influences [18].

In recent years, other experimental works appeared [19–23] in which the changes in the decay rates of various radioactive elements sufficiently above the metering errors are recorded. For example, when introducing ^{7}Be into the fullerene ^{60}C in the course of nearly 160 days, the deviation up to 0.83% in the half-life between ^{7}Be in ^{60}C and ^{7}Be in the metal was recorded [19]. In Ref. [20], a non-exponential radioactive decay of nuclei-isomers of ^{125m}Te during uninterrupted measurements of γ-radiation in the course of a year, was also observed.

These changes are shown to have a periodic character [5, 9, 12 – 17, 21 - 23]. In the paper [21], annual oscillations when investigating the half-period $T_{1/2}$ of ^{32}Si (β-decay) from 1982 till 1986 in the Brookhaven National Laboratory (BNL, USA), are found out. Reference [22] presents results of $T_{1/2}$ measurements carried out in Germany, at the "Physikalisch-Technische Bundesanstalt (PTB)", with the use of an ionization chamber for ^{226}Ra (α – decay) from 1982 till 1999.

The number of papers devoted to the investigation of decay rate variation of radioactive elements increases steadily [24 - 27].

The present article is devoted to the universal property of global anisotropy of physical space and to a new interaction in nature acting over a wide range of dimensions, based on analyzing fluctuations in the intensity of the β- decay (10^{-17} cm) in our latest work [17] and other new publications, α-decay of radioactive elements (10^{-13} cm) [22], motion of pulsars [9, 28 - 31] (size of our Galaxy (10^{22}cm), and anisotropy of cosmic rays up to ultrahigh energies [32] (size of our Universe 10^{28} cm).

2. Global Anisotropy of Physical Space and Changes in β-Decay Rate of Radioactive Elements

2.1. About Physical Space

The physical space was always given in all the science, in one way or another, and motion equations for a system of objects under study were written in that space. Space could be either a uniform continuum (Newton, Minkovsky) or discrete, one-dimensional or multidimensional, asf. In present-day cosmologic models of the Universe origin (Gamov's Big Bang [33], Linde's model of bulging Universe [34], and so on), space is always given, too. But in the theory of byuons, the physical space (necessarily the three-dimensional one – R_3, not ten-or-more-dimensional as in modern physical models) is a special quantized medium arising as the result of minimization of potential energy of byuon's vacuum states interaction in the one-dimensional space R_1 formed by them.

That is, space is not given but *arises*. Therewith the appearing three-dimensional space originated must have a slight global anisotropy (10^{-15} – free physical space; 10^{-5} – intrinsic physical space of elementary particles), as distinct from all basic isotropic models with the same properties in various directions. The said anisotropy denotes the existence of some chosen direction caused by the existence, in nature, of a new fundamental vectorial constant, the cosmological vector-potential A_g entering into the definition of the byuon. This new constant is associated with the prediction of a novel anisotropic interaction of natural objects between themselves and with the physical vacuum, a lowest energy state of physical fields.

It should be noted that in the literature spaces with local rather than global anisotropy, are considered [35], for example, the Finsler's space-time [36], but the local anisotropy is given therein "by hand", as the saying goes. That is, the author himself directively introduces it into his model instead of obtaining it from some general principle. For example, there are domain models of the Universe.

Why should we investigate a weak interaction? The characteristic size of this interaction is equal 10^{-17}cm. Therefore this interaction must feel the global anisotropy of physical space because the space forms on this distance scale in accordance with the theory of byuons [5, 9].

The direction of this new force of nature was investigated in [5, 9, 12-17] using data related to changes in β-decay rate of different radioactive elements (^{60}Co, ^{137}Cs, ^{90}Sr). For example, it was shown in [9, 14] that of the three anisotropic directions recorded in studying the β decay of radioactive elements (^{60}Co, ^{137}Cs), two coincide with the generatrices of the revealed cone and one direction is along the cone axis (direction of vector A_g).

In this article we discuss the results of our latest work [17] and new data of this experiment investigating the direction of physical space anisotropy.

The choice of the radioactive source in [17] is determined by the results of previous experiments and the intention to maximize the effect of action of the new force of the nature responsible for the variation in the β-decay rate of radioactive elements and to minimize systematic errors. The analysis of experimental results [5, 9, 12-16] has shown that the value of the β-decay rate variation is larger for the radioactive elements having a nucleus with large magnetic moment. This condition corresponds with the nature and features of the new force. Thereupon the radioactive β source ^{60}Co was chosen for the investigation. The presence of two lines, 1.117 MeV and 1.332 MeV, in its spectrum, allows the two γ-quanta detection in coincidence and minimizes electronics-dependent systematic errors.

Let's shortly describe the experimental installation. It is placed in a thermostated housing that keeps temperature within the limits 30.6°C ± 0.1°C. The detecting module contains a radioactive β source ^{60}Co and a two-arm scintillation γ-spectrometer in a hermetic case. Either of the two detectors records about 32 thousands of γ-quanta per second. A $LaBr_3(Ce)$ crystal is used as scintillation counter, the relative energy resolution of which equals 3%. The crystal has a diameter of 25 mm and a height of 12 mm. The flowchart of the γ-spectrometer electronics is shown in [16, 17]. It consists of two identical microprocessor-based assemblages and common control and power supply blocks. To receive the synchronization signal, the apparatus has a CAN interface on the motherboard.

The basic results of long-term investigations of variation of ^{60}Co -decay rate from 28.12.2010 till 08.02.2012 are presented in [17].

We used the Kolmogorov-Smirnov (K-S) statistical method to analyze the global anisotropy of physical space [5, 9, 16, 17, 37] because the effect is so small that it is not visual observed using scintillation flux counter. The K–S criterion is based on computation of the maximum difference between the theoretical hypothesis and the experimental distribution function. This difference is compared with tabulated Kolmogorov function values. In our case the theoretical function is the uniform distribution of γ-quanta intensity in the course of a day.

Assessment of the compatibility of observed series of counts with the uniform distribution by K–S test is shown only for decades where the significance level was less than 0.3:

March 11-21, with the significance level a = 0.1; temperature correlation ~ 0.05%;

April 22 - May 02, with the significance level a = 0.0125; temperature correlation ~ - 0.04%;

June 24 - July 04, with the significance level a = 0.05; temperature correlation ~ 2.1%;

August 04 - 14, with the significance level a = 0.05; temperature correlation ~ 0.2%.

As an example, Fig. 1 shows the data analysis for the decade Mach 11 – 21 in 2010 and in 2011. (The physical space is not stable. Therefore we have the coincidence of effect maximum only in one decade in March for 2010 and 2011 years).

If K–S goes above the horizontal line, the hypothesis is rejected with probability (1 - a), for example, 0.98 for year 2010 and 0.9 for year 2011 (Fig.1), therefore there are statistically significant differences between the experimental and theoretical distributions. In the case under consideration, where the theoretical distribution is selected to be uniform, this means nonuniformity of the measured value within the course of a day.

The spatial positions of sites where the clearly expressed extrema in the magnitude of the flow of γ-quanta in the experiment with the β-decay of ^{60}Co were observed in [17] are shown in Fig 2. The direction of vector A_g (A_G) in Fig.2 is the direction of the cosmological vectorial potential defined in [9, 11] (right ascension α = 293° ± 10°; declination δ = 36° ± 10°.). We see that the directions of new force action in decades April 22 - May 02 and June 24 - July 04 coincide with the direction of vector A_g. The directions of new force action in decades March 11-21 and August 04 – 14 coincide with the generatrices of the revealed cone of new force action [9, 11].

3. Global Anisotropy of Physical Space and Changes in A -Decay Rate of Radioactive Elements

The changes in α-decay rate of radioactive elements is not under the action of this new force or any other force because α–decay is a tunnel effect of α particles across a potential barrier (characteristic size of effect is equal to 10^{-13}cm). But the theory of byuon decides this problem other way. For understanding the latter we must consider a basic thesis of this theory.

Thus, let us assume that there are no space, no time, no world of elementary particles from which all surrounding physical bodies consist, but there is an unobservable object:

a *byuon* Φ(i) characterized by discrete states (i.e. numbered by the series of natural numbers) [5, 9] having inherent "vectorial" property.

The expression for free Φ(i) is

$$\mathbf{\Phi}(i)=\begin{cases}[\mathbf{A}_g x(i)],\\ -\sqrt{-1}[\mathbf{A}_g x(i)]\end{cases} \quad (1)$$

where *x(i)* is the "length" of the byuon, a real (positive or negative) value depending on the index i = 0,1,2,…k,… Index i is a quantum number for $\Phi(i)$[1]. The value A_g is some inner potential equal, in magnitude, to the cosmological vector-potential A_g, a novel fundamental vectorial constant introduced by the author in [1, 5]. It is not an ordinary potential of any field theory since we have yet no notions of field and its potential. We have to do with a special property of the byuon that we call therefore the inner byuon potential. The dimensionality of *x(i)* is that of distance, so we will measure *x(i)* in centimeters (cm), and A_g in Gauss centimeter ($A_g \approx 1.95\cdot10^{11}$Gs·cm). Basic results of byuon theory are shown in Appendix and [5, 9].

For understanding of the changes in α-decay rate of radioactive elements we consider only two items of byuon theory:

- the value of byuon is constant for free and interacting byuons;
- $ct^*/ k\ \tilde{x}_0$ = constant = N (see Appendix).

The size of our effect is equal to 10^{-13} cm. It is equal to the size of a nucleus: $ct^* = kN\tilde{x}_0$ (see Appendix). In accordance with byuon theory

$$A_\Sigma\cdot x(i) = \text{constant} = A_\Sigma\cdot k\tilde{x}_0 \quad (2)$$

In (2) k is the value of byuons interaction period (k $\approx 3\cdot10^{15}$);

It is a whole number; $\tilde{x}_0 \approx 2.8\times10^{-33}$cm - the quantum of space is a given value in this theory.

If the value of A_Σ is changed then the value k is changed too (see [2]), and accordingly the size of a nucleus (kN $\tilde{n}_0$). Therefore we see the variation of α-particles tunneling through the Coulomb barrier.

The value of A_Σ contains all the potentials of physical fields. The resulting influence of vector potentials of magnetic fields of Sun and Earth on A_Σ are shown in [5, 9, 12-17]. The influence of a gravitational potential of Sun is shown in [29]. In the last case the expression for variations of A_Σ are:

$$\delta|\Delta A_\Sigma| = \Delta R\,(G\, m_e M_s)/(R^2 \mathbf{e} \sin\gamma) = 5{,}6\cdot10^8\text{Gs cm} \quad (3)$$

1 It should be explained that the vector Φ(i) is not an ordinary vector in some space but an object with "inner" vectorial properties that are manifesting themselves when the value x(i) changes in the process of physical space formation.

where e is the electric charge of the electron, m_e is its mass, $|\Delta A_\Sigma|$ - the change of the modulus A_Σ due to the influence of the gravitational potential of the Sun on the Earth orbit, sin γ is a parameter estimated in [5, 9] (sin $\gamma \approx 1/k$ where k $\approx 3\cdot10^{15}$, see above), and characterizing the anisotropic properties of the physical space; G is the gravitation (Cavendish) constant, $M_s = 2\cdot10^{33}$ g is the mass of the Sun; and R = $1.5\cdot10^{13}$ cm - the average distance between the Earth and the Sun. The difference ΔR between the distances of the Earth from the Sun in perihelion (147.5 millions km) and in aphelion (152.6 millions km) is of the order of 5 millions km, resulting in the corresponding variations of vectorial potential modulus A_Σ .

This value is comparable with the vector potential of the Earth as well as with that of the solar magnetic field. Notice that $\delta|\Delta A_\Sigma| \sim 1/R^2$, which corresponds to observation results in [24, 25] with ^{226}Ra (The direction of vector A_g (A_G) in Fig.3 is the direction of the cosmological vectorial potential defined in [9,11]), and the abrupt change in the decay rate in spring (see [22, 24, 25], 1988) as well as the minimum decay deviations in spring-summer 1986, were in proximity to the polarity change of the Sun's magnetic dipole (22nd 11-years cycle), whereas the minimum deviations and very considerable changes in the decay rate registered at the end of 1998 in an experiment with ^{226}Ra precede the beginning of the 23rd solar cycle (beginning of 1999) [38]. The latter decay deviations were, in all likelihood, taken by the authors of [22] as development of instabilities in equipment, that may be correct. Of course, the issue of possible connection between changes in the decay and the 11-year solar cycle invites further investigations and evidences.

The angular histogram of season distribution of maxima and minima of decay rates on the Earth orbit (a) in the process of its motion around the Sun for a 15-years experiment with ^{226}Ra ([22, 24, 25]) is shown Fig.3. Maxima are indicated by arrows, minima by black rectangles. The Sun is in the center of the diagram. On the line from the orbit portion with decay maxima or minima to the place of the Sun, the corresponding years are indicated. The direction of vector A_G in Fig.3 is the direction of the cosmological vectorial potential shown in Fig. 2. We see that the direction of line: minima-maxima of α–decay in experiment with ^{226}Ra is very near to the direction of vector A_g.

4. Motion of Pulsars, Anisotropy of Cosmic Rays and Global Anisotropy of Physical Space

Let us elucidate the action of the new force on pulsars. Pulsars are neutron stars formed in the result of explosion of a Supernova, with the rotation period down to an order of 10^{-3} sec. As shown in the works [28 - 31], the observable velocities of pulsars and their angular distribution can be explained by the action of the new force that must clearly reveal itself in the process since the magnetic fields of pulsars may be as great as 10^{12} Gs, and hence the magnitudes of the vector potential may come close to the modulus of A_g.

The reactive effect causes a pulsar to move oppositely to the direction of the new force. As seen in Fig. 3, the main masses of pulsars move along the reverse cone of the new force action, which is in correspondence with the prediction of the byuon theory and the angular opening of the season variation of ^{226}Ra decay rate also given in Fig.3. The pulsars are very good instruments for investigation of the direction of vector A_g. But the pulsars give the information only at the scale of our Galaxy (10^{22} cm).

Anisotropy of cosmic rays (CR) can give the information about the direction of vector A_g [32] at the size of our Universe (10^{28} cm), if these CR have ultrahigh energy. In [32] the influence of a new anisotropic factor onto the mechanism of accelerating cosmic rays up to ultrahigh energies (CR UHE) due to a new global natural force with anisotropic behavior is considered.

Let's discuss this work. During the motion in the Universe the proton can cover, in the vicinity of galaxies, space distances where $\Delta A_\Sigma \approx 10^{11}$Gs cm. This value is the limiting one for our Universe and can be caused by the action on ΔA_Σ of vector potentials of magnetic fields influenced by gravitational potentials [29].

It is commonly supposed that the protons in the Galaxy diffuse to the Earth for ten thousand years so that the whole distance $L \approx 10^{22}$ cm (the measure of a medium-sized galaxy is $\sim 10^{24}$ cm [39]). If the force considered acts on scales of L, the energy imparted to the proton by the new force will be of order of 10^{27}eV (much higher than the Greisen-Zatsepin-Kusmin energy limit, which is equal to $5 \cdot 10^{19}$eV). It should be noted that, in order to estimate the energy of cosmic rays, we have used the linear approximation of the new force [5, 8, 9,] that gives, as the ground experiments show [6 - 9], a value near an order of magnitude greater for the new force of nature. In addition, the interaction with the relic radiation will naturally diminish the value of energy obtained, but the anisotropic properties of the assumed new force are bound to affect the anisotropy of CR UHE. The coordinates of their arrival to the Earth will be in correspondence with the opposite directions to the new force cone of action. The work [32] demonstrates that the directions of action of the new force and anisotropy of CR of middle energy are near. The Cygnus Region (α = 305°±5°, δ = 40°±5°) shown in Fig. 4 practically corresponds to the direction of the cosmological vector potential A_g. It is no coincidence. The cause can be that the CR accelerated by the new force can, when interacting with substance, give rise to γ-quanta that move precisely in the opposite direction to the global anisotropy associated with the existence of vector A_g. But these CR can be CR UHE. Therefore they can give information about the direction of vector A_g at the scale of our Universe.

The necessary remark.

From Birch's works [40,41], the question of possible rotation of the Universe as a whole is discussed in the literature [42] (Note that even Aristoteles argued on this point [43]). When observing correlation between angle of light polarization and position of remote light sources, Birch assumed the Universe to have an axis of rotation with coordinates $\alpha = 180° \pm 30°$, $\delta = -35° \pm 30°$. It is other global anisotropy. It is shown in [5] that any rotation of objects originates in the process of minimizing potential energy of byuon interaction. Therefore planets, stars, galaxies are rotating. But the arrangement of their axes of rotation in space is influenced also by many random factors leading to an isotropic distribution of them. But the entire Universe is quite another thing. Its rotation axis should be perpendicular to the vector $\vec{A}_G$. The Birch's results are near to above said, of course with due regard for exactness of his and our experiments.

In Ref. [44] the results of determining the axis of rotation of the Universe are given, too ($\alpha = 315° \pm 30°$, $\delta = 0° \pm 20°$). As seen, they differ from the results of Birch but are doubted by the author of the present article since the axis of Universe's rotation lies in the plane of the celestial equator. Nevertheless, these results also confirm our theoretical prediction that the Universe must rotate as a whole.

5. Conclusion

A brief comparative analysis of results of experimental investigations of fluctuations in the intensity of the β and α-decay of radioactive elements, motion of pulsars and anisotropy of cosmic rays shows spatial directions very close to the directions of vector A_g. But the results of our experiments performed in a laboratory on Earth near the Sun can be influenced by the different potential fields of Earth and Sun, therefore the direction of vector A_g should be close to the direction of the Cygnus Region and equal to (α = 300°±10°, δ = 36°±10°).

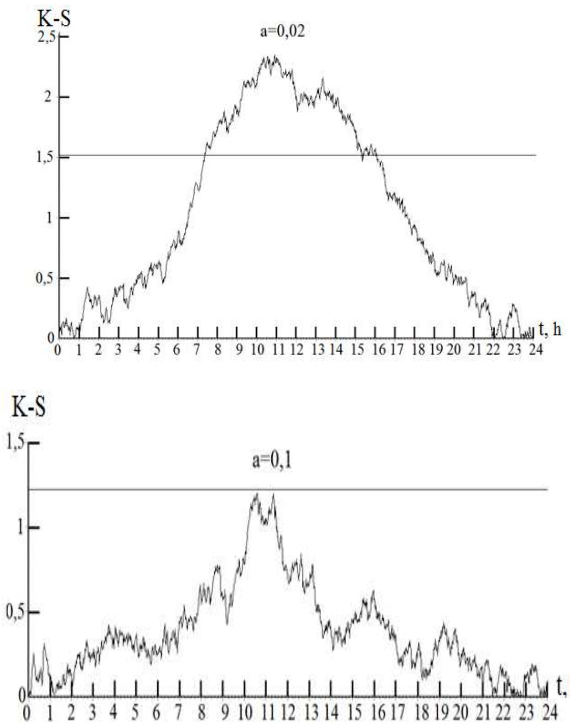

Fig 1.The statistical Komogoroff-Smirnoff's criterion for March 11 – 21 in 2010 and in 2011. Horizontal line – the value of K-S criterian for the indicated significance level (a = 0.02 for 2010, a = 0.1 for 2011).

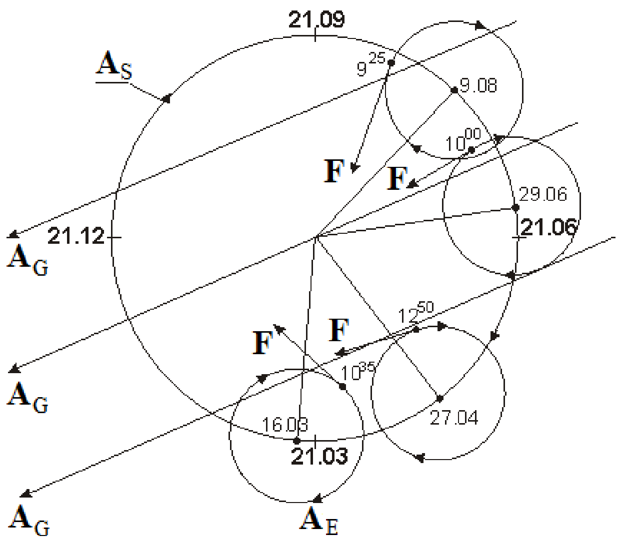

Fig 2.The spatial positions of sites where the clearly expressed extrema in the magnitude of the flow of γ-quanta in the experiment with the β-decay of ^{60}Co were observed in [17] (see Fig 1 too).

- the site of the maximum flow of γ-quanta with the indication of the direction of action of the new force F drawn along the tangent line to the parallel of latitude;

21.03 etc. –the point of the vernal equinox and other characteristic points of the trajectory of motion of the Earth and the radioactive source around the Sun;

A_E –the direction of the vectorial potential of the magnetic field of the Earth's dipole;

A_S –the direction of the vectorial potential of the magnetic field of the Sun's dipole;

A_G – the direction of the cosmological vectorial potential.

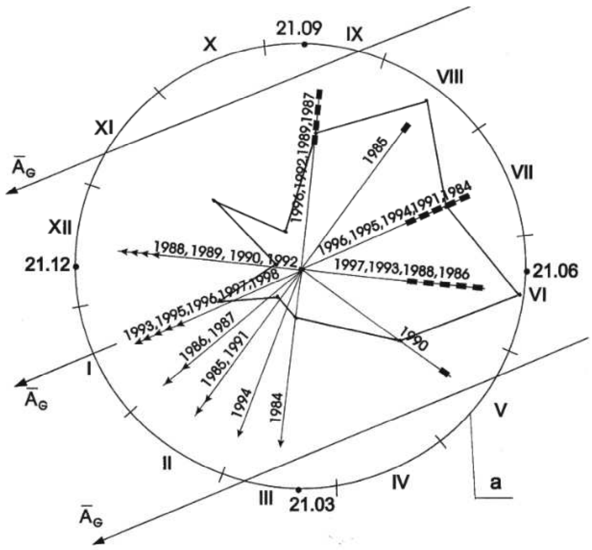

Fig 3. The angular histogram of season distribution (fourth and further months of year) of maxima and minima of decay rates on the Earth orbit (a) in the process of its motion around the Sun for a 15-years experiment with ^{226}Ra([22]). Maxima are indicated by arrows, minima by black rectangles. The Sun is in the center of the diagram. On the lines directed from the portion of the orbit with decay maxima or minima to the place of the Sun, the corresponding years are indicated.

The solid line shows angular distribution for velocity directions of pulsars motion.

I, II etc. – months of year;

1988, 1989 etc. –years of maxima and minima of decay rates;

A_G - the cosmological vector potential;

21.03- etc. are characteristic points of the Earth orbit.

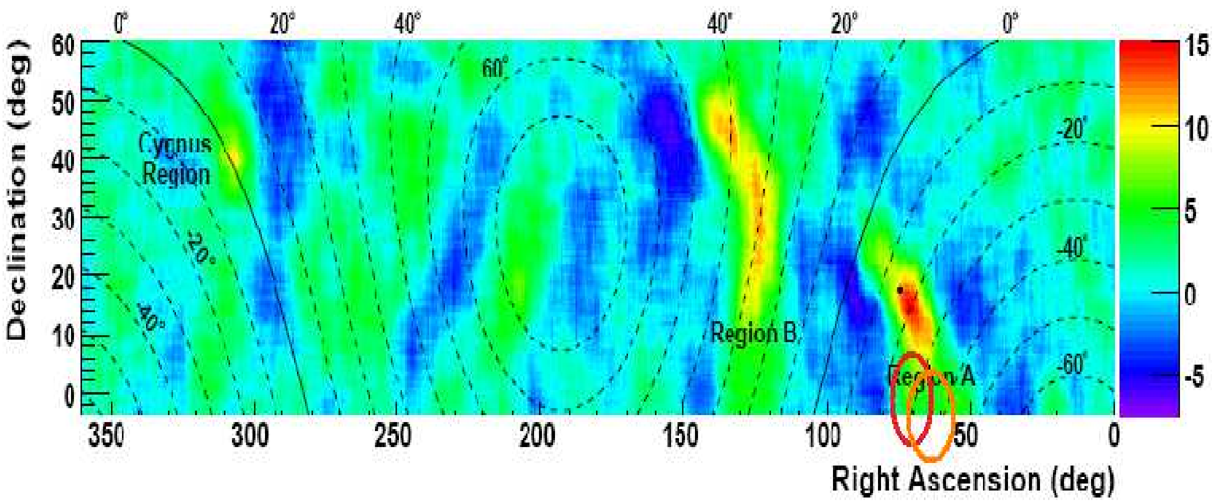

Fig 4. The directions of arrival of cosmic ray particles with the energy of 1-10 TeV according to data from the detectors: Milagro (basic map), Tibet (red ellipse), and Super-Kamiokande (pink ellipse). The increase of intensity: dark blue → red.

Appendix

Table 1. *Basic results of byuon theory.*

Given	Obtained
6. The quantum of space $\tilde{x}_0 \approx 2.8 \cdot 10^{-33}$cm. 7. The quantum of time $\tau \approx 0.9 \cdot 10^{-43}$s. 8. The module of cosmological vector-potential $\mathbf{A_g}$. $A_g \approx 1.95 \cdot 10^{11}$Gs·cm	a. The fundamental scales: $x_0 = k\ \tilde{x}_0 \approx 10^{-17}$cm; $ct^* = kN\,\tilde{x}_0 \approx 10^{-13}$cm; $L = kNP\,\tilde{x}_0 \approx 10^{28}$cm; k,N,P - calculated periods of interaction of byuons. b. The fundamental constants: speed of light $c_0 = \tilde{x}_0 / \tau$; the elementary electric charge $e_o^2 = (1/(4\sqrt{3}))A_g^2 x_o^2 (x_o/ct^*)^{3/2}$ Planck's constant $h = (([A_g\, x_o]_{II}^{+}[A_g\, x_o]_{I}^{-})/c_o)x_o/ct^*$. c. The constants of all interactions, for example, vector constant of weak interaction $C_w = e_o A_g 2 x_o^3$. d. Mass spectra of leptons (electron, muon, tau-lepton asf.), main barions, and mesons , for example, the mass of electron: $m_e c^2 = m_{46} c^2 (ct^*/x_o)$; the minimum value of that residual potential energy : $E^0_{k_{\min}} = (A_g{}^2 \tilde{x}_0{}^2)/(2\tilde{x}_0) = m_{46}c^2 = 33$eV. e. The density of matter in the Universe ~ 10^{-29}g/cm^3 (physics of dark matter and dark energy on the base of new force)

References

[1] Yu.A. Baurov, Yu.N. Babaev and V.K. Ablekov, Dokl. Akad. Nauk SSSR, 1981, vol. 259, no. 5, p. 1080.

[2] Yu.A. Baurov, Yu.N. Babaev and V.K. Ablekov, Dokl. Akad. Nauk SSSR, 1982, vol. 262, no. 1, p. 68.

[3] Yu.A. Baurov, Yu.N. Babaev and V.K. Ablekov, Dokl. Akad. Nauk SSSR, 1982, vol. 265, no. 5, p. 1108.

[4] Yu.N. Babaev, and Yu.A. Baurov, On the Origin of Fundamental Constants and Some Quantum Numbers, Preprint of Institute for Nuclear Research of the USSR Academy of Sciences, 1984, no. P–0362.

[5] Yu. A. Baurov "On the Structure of Physical Vacuum and a New Interaction in Nature (Theory, Experiment and Applications)", Nova Science, NewYork, 2000.

[6] Yu.A. Baurov, E.Yu. Klimenko and S.I. Novikov, Dokl. Akad. Nauk SSSR, 1990, vol. 315, no. 5, p. 1116.

[7] Yu.A. Baurov and P.M. Ryabov, Dokl. Akad. Nauk SSSR, 1992, vol. 326, no. 1, p. 73.

[8] Yu.A. Baurov, Phys. Lett. A, 1993, vol. 181, p. 283.

[9] Yu.A. Baurov, Global Anisotropy of Physical Space.Experimental and Theoretical Basis, New York: Nova Science., 2004.

[10] Yu. A. Baurov and A. V. Kopaev, Hadronic Journal, Vol. 25, 2002, pp 697-711.

[11] Yu.A. Baurov, et al., Phys. Lett. A311, 2003, p. 512.

[12] Yu. A. Baurov and V. L. Shutov, PrikladnayaFizika, No. 1, 40 (1995), (in Russian)

[13] Yu. A. Baurov, A. A. Konradov, V. F. Kushniruk and Yu. G. Sobolev, Scientific Report № E7-97-206, (Dubna, 1997), p.354.

[14] Yu. A. Baurov A. A. Konradov, E. A. Kuznetsov et al., Mod. Phys. Lett. A16, 2089 (2001).

[15] Yu. A. Baurov, Yu. G. Sobolev, Yu. V. Ryabov, V. F. Kushniruk., Phys. Atom. Nucl. 70, 1825 (2007).

[16] Yu. A. Baurov, N. A. Demchuk, A. Yu. Baurov, A. Yu. Baurov (Jr.), V. B. Dunin, V. V. Tihomirov, S. V. Sergeev, Prikladnaya fizika5, 12 (2011). (in Russian).

[17] Yu. A. Baurov, V.A. Nikitin, V. B. Dunin, N. A. Demchuk, A. Yu. Baurov, A. Yu. Baurov (Jr.), V. V. Tihomirov, S. V. Sergeev, arXiv:1304.6885 [nucl-ex].

[18] D. N. Trifonov, Radioactivity Yesterday, Today, Tomorrow, Atomizdat, Moscow, 1966, p. 91, (in Russian).

[19] T. Ohtsuki et al., Phys. Rev. Lett. 93, 112501 (2004).

[20] S. K. Godovikov, Pis'maZh. Erksp. Teor. Fiz. 79, 249; (2004) [JETP Lett. 79, 196 (2004)].

[21] D. E. Alburder, G. Harbottle, and E. F. Norton, Earth and Planet. Sci. Lett. 78, 169 (1986).

[22] H. Siegert, H. Schrader, and U. Schotzig, Appl. Radiat. Isot. 49, 1397 (1998).

[23] S. E. Shnol et al. Uspehi phys. Nauk, 168, 1129 (1998), (in Russian).

[24] J. H. Jenkins et. al. Astro-ph/0808.3283, 25 Aug. (2008).

[25] E. Fischbach et. al. Space Sci. Rev. 145, 285 (2009).

[26] E. Bellotti et.al. Phys. Lett. B710, 114 (2012).

[27] J. H. Jenkins, E. Fischbach, D. JavorsekII, Robert H. Lee, P. A. Sturrock, Appl. Radiat. Isot.74, 50 (2013).

[28] Yu. A. Baurov, A. A. Shpitalnaya, I. F. Malov, International Journal of Pure & Applied Physics, 1, 71, 2005.

[29] Yu. A. Baurov, I. F. Malov, Int. J. Pure & Appl. Phys. 6, 469 (2010).

[30] I. F. Malov, Yu. A. Baurov, Astronomy Reports, 51, 830,

2007.

[31] Yu. A. Baurov, Bull. Russ. Acad. Sci. Phys. 76, 1076 (2012).

[32] Yu. A. Baurov, Journal of Modern Physics, 2012, 3, 1744

[33] R. A. Alpher, M. Bethe, G. Gamov, Phys. Rev., 1946, v.70, p.572; i bid: 1948, v.73, p.803.

[34] A. D. Linde, Uspekhi Fizicheskikh Nauk, 1984, v.144, p.177.

[35] G. Yu. Bogoslovsky, Theory of locally anisotropic space-time. Ed. by Moscow State University, 1992 (in Russian).

[36] Kh. Rund, Differential geometry of Finsler's spaces. Moscow, "Nauka", 1981.

[37] The mathematical encyclopaedia, Moscow, " Big Russian encyclopaedia, 1995.

[38] I. S. Veselovsky et al., Rom. Astron. J., 9, 29, Supplement, 1999.

[39] "Astronomy: Century XXI". Ed. V. G. Surdin. "Fryazino: century XX" (2007) (in Russian).

[40] P. Birch, Nature, 1982, v.298, p.451.

[41] P. Birch, Nature, 1983, v.301, p.736.

[42] V.I.Panov, Yu.G.Sbytov, ZhETF, 1992, v.101, N3.

[43] Aristoteles, v.3, Moscow, "Mysl", 1981 (in Russian).

[44] B.Nodland, J.P.Ralston, Phys. Rev. Lett., 1997, v.78, p.3043.