DOES NEUTRINO REALLY EXIST?

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Abstract

An analysis of known experiments on direct and indirect detection of the electron-type neutrino and antineutrino has been made. The analysis based on a new hypothesis that the observed physical space is formed from a finite set of byuons, ”one-dimensional vectorial objects”. It is shown in the article that the hypothesis for existence of neutrinos advanced by Pauli on the basis of an analysis of the conservation laws, is not unquestionable since the fulfillment of these laws may be secured by the physical space itself (physical vacuum) being the lowest energy state of a discrete oscillating system originating in the course of byuon interaction. This effect is analogous to that of Mössbauer. The direct experiments on detecting neutrinos are explained from the existence of a new information channel due to the uncertainty interval for coordinate of the four-contact byuon interaction forming the interior geometry of elementary particles and their properties. Given are also the results of an experiment on observation of cyclic variations of the $\beta$-decay rate, which confirm the existence of said new information channel.
1 Introduction.
As is known [1], neutrino (electron-type one) was discovered by Pauli "on the tip of his pen", on the basis of analysis of conservation laws. Recently, a number of papers [2]-[10] has evolved which extends considerably our knowledge of neutrino physics. In Refs. [2]-[7], it is shown by various research teams on the basis of investigation of tritium spectrum end that mass of neutrino is less than zero. In Ref. [8], results of precision measurements of tritium spectrum end are presented which suggest that mass squared of the electron-type neutrino $m_{\nu_e}^2 < 0$. This artifact is explained in Ref. [9] with the aid of long range interactions of anomalous neutrinos through introducing a potential equal to the sum of those of Yukawa’s type. In Ref. [10], these unique experimental results are explained by introducing a weakly interacting light scalar boson through which the neutrinos interact in some cloud. It is shown in so doing that the parameters of neutrinos will be cloud density dependent. This work develops the assumption of Ref. [2] that to account for the experiments, the density of neutrinos is necessary which is $10^{13}$ times greater than that accepted in cosmology.

In the new physical conception [11, 12] of forming the observed three-dimensional physical space $R_3$ from a finite set of one-dimensional discrete "magnetic" fluxes, new physical objects which will henceforward be named byuons [4], was firstly formulated. In quantum field theory, the space observed is usually given [13], and in modern superstring and supersymmetric theories, this space (Minkovsky’s one) is obtained through compactification of "excessive" dimensions [14, 15, 16]. The byuons $\Phi(i)$ are one-dimensional vectors and have the form:

$$\Phi(i) = A_g x(i),$$

where $x(i)$ is the "length" of the byuon, a real (positive, or negative) value depending on the index $i = 0, 1, 2, ..., k, ...$, a quantum number of $\Phi(i)$; under $x(i)$ a certain time charge of the byuon may be meant [17]. The vector $A_g$ represents the cosmological vectorial potential, a new basic vectorial constant [11, 12, 18]. It takes only two values:

$$A_g = \{A_g, -\sqrt{-1}A_g\},$$

where $A_g$ is the modulus of the cosmological vectorial potential ($|A_g| = 1.95 \cdot 10^{11}$ CGSE units).

According to the theory [11, 12], the value $A_g$ is the limiting one. In reality, there exists in nature, in the vicinity of the Earth, a certain summary potential $A_{\Sigma}$, i.e. the

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1In connection with the numerous comments: in order to make distinction between these new physical objects and the conventional magnetic fluxes existing in classical electrodynamics.
vectorial potential fields from the Sun ($A_\odot \approx 10^8$ CGSE units), the Galaxy ($A_G \approx 10^{11}$ CGSE units), and the Metagalaxy ($A_M > 10^{11}$ CGSE units) are superimposed on the constant $A_g$ resulting probably in some turning of $A_\Sigma$ relative to the vector $A_g$ in the space $\mathbf{R}_3$ or in a decrease of it.

Hence in the theory of physical space (vacuum) which the present article leans upon, the field of the vectorial potential introduced even by Maxwell gains a fundamental character. As is known, this field was believed as an abstraction. All the existing theories are usually gauge invariant, i.e., for example, in classical and quantum electrodynamics, the vectorial potential $A$ is defined with an accuracy of an arbitrary function gradient, and the scalar one is with that of time derivative of the same function, and one takes only the fields of derivatives of these potentials, i.e., magnetic flux density and electric field strength, as real. In Refs. [11, 12, 18, 19], local violation of the gauge invariance was supposed, and the elementary particle charge and quantum number formation processes were investigated in some set, therefore the potentials gained an unambiguous physical meaning there. In the present paper, this is a finite set of byuons. The works by D.Bohm and Ya.Aharonov [20]-[23] discussing the special meaning of potentials in quantum mechanics are the most close to the approach under consideration, they are confirmed by numerous experiments [24, 25]. The byuons may be in four vacuum states (VS) $II^+, I^+, II^-, I^-$, in which they discretely change the value of $x(i)$: the state $II^+$ discretely increases and $I^+$ decreases $x(i) > 0$, the states $II^-$ and $I^-$ discretely increase or decrease the modulus of $x(i) < 0$, respectively. The sequence of discrete changes of $x(i)$ value is defined as a proper discrete time of the byuon. The byuon vacuum states originate randomly [11, 12]. In Refs. [11, 12], the following hypothesis I has been put forward. It is suggested that the space $\mathbf{R}_3$ observed is built up as a result of minimizing the potential energy of byuon interactions in the one-dimensional space $\mathbf{R}_1$ formed by them. More precisely, the space $\mathbf{R}_3$ is fixed by us as a result of dynamics arisen of byuons. The dynamic processes and, as a consequence, wave properties of elementary particles appear therewith in the space $\mathbf{R}_3$ for objects with positive potential energy of byuon interaction (objects observed). Let us briefly list the results obtained earlier when investigating the present model of physical vacuum:

2.1. The existence of a new long-range interaction in nature, arising when acting on physical vacuum by the vectorial potential of high-current systems, has been predicted [26]-[30].

2.2. All the existing interactions (strong, weak, electromagnetic and gravitational ones) along with the new interaction predicted have been qualitatively explained in the unified context of changing in three periods of byuon interactions with characteristic scales - $10^{-17}$ cm, $10^{-13}$ cm, and $10^{28}$ cm, determined from the minimum potential energy of byuon interaction [12, 17].

2.3. Masses of leptons, basic barions and mesons have been found [18, 33].

2.4. The constants of weak interaction (vectorial and axial ones) and of strong interaction have been calculated [18, 33].

2.5. The origin of the galactic and intergalactic magnetic fields has been explained as a result of existence of an insignificant ($\approx 10^{-15}$) asymmetry in the formation process of $\mathbf{R}_3$ from the one-dimensional space of byuons [11, 12].

2.6. The substance density observed in the Universe ($10^{-29} g/cm^3$) has been calculated [11, 12].

2.7. The origin of the relic radiation has been explained on the basis of unified
mechanism of the space $R_3$ formation from one-dimensional space $R_1$ of byuons [11, 12], etc.

Let us explain item 2.1 briefly. It is shown in Ref. [33] that masses of all elementary particles are proportional to the modulus of $A_g$. If now we direct the vectorial potential of a magnetic system in some space region towards the vector $A_g$ then any material body will be forced out of the region where $|A_Σ| < |A_g|$. The new force is nonlocal, nonlinear, and represented by a complex series in $ΔA$, a difference in changes of $|A_g|$ due to the potential of a current at location points of a sensor and a test body [12, 29]. This force is directed mainly along the vector $A_g$, but as the latest experiments have shown, there is also an isotropic component of the new force in natures, which component acts omnidirectionally from the space of the maximum decrease in $|A_g|$. Corresponding to it are probably the even terms in a series representing the new force [12, 29].

One of the important predictions of the theory is revealing a new information channel in the Universe which is associated with the existence of a minimum object with positive potential energy, so called object 4B, arising in the minimum four-contact interaction of byuons in the vacuum states $II^+, I^+, II^−, I^−$. In four-contact byuon interaction, a minimum action equal to $h$ (Planck's constant) occurs, and the spin of the object appears. Hence the greater part of the potential energy of byuon interaction is transformed into spin of the object 4B. The residual (after minimization) potential energy of the object 4B is equal to $≈ 33 eV$, it is identified with the rest mass of this object in the space $R_1$. In agreement with Refs. [11, 12], the indicated minimum object 4B has, according to Heisenberg uncertainty relation, the uncertainty in coordinate $Δx ≈ 10^{28} cm$ in $R_3$. The total energy of these objects determines near 100% energy of the Universe as well as its substance density observed. In such a manner the objects 4B connect together, due to the uncertainty relation, all the elementary particles of the Universe and hence all the objects in the animate and inanimate nature as composed of elementary particles. The greater is the number of elementary particles of substance in some place of space, the greater is also the number of objects 4B there because the latters form the interior geometrical space of elementary particles [11, 12].

### 3 Analysis of experiments on detecting neutrino.

All the experiments proving the existence of neutrino may be divided into two groups in the first of which we are dealing with the circumstantial evidence, starting from the conservation laws, that neutrinos exist [34, 35] among these are also the papers [3-8], whereas the second group of experiments has pretensions to the direct corroboration of neutrino existence [36, 37].

Let us consider the first experiment on detecting neutrino, which was carried out by A.I.Leipunsky [36] and relates to the first group of above mentioned ones. The idea of his experiment was constructed on comparison of energetic spectra of electrons and recoil nuclei produced during the $β$-decay. If a neutrino (antineutrino) were not emitted in this process, the law of conservation of momentum would be obeyed:

$$P_e + P_{r,n} = 0, \quad |P_e| = |P_{r,n}|$$  \hspace{1cm} (1)
where \( P_e \) is momentum of \( \beta \)-electron, \( P_{r,n} \) is momentum obtained by the recoil nucleus during \( \beta \)-decay. If however a neutrino (antineutrino) is emitted in \( \beta \)-decay, the law of momentum conservation has the form

\[
P_e + P_{r,n} + P_\nu = 0,
\]

and then

\[
|P_e| \neq |P_{r,n}|.
\]

A.l.Leipunsky, when investigating the process of \( \beta^+ \)-decay in his experiments with the carbon isotope \( ^6C \) has validated the inequality (3) and thereby, as he believed, proved the existence of neutrino. The Leipunsky’s experiment and those in the first group can be explained on the assumption that the conservation laws of momentum, angular momentum etc., are taken over by a large-scale object, the physical space (physical vacuum) of the Universe. An analogy to such a phenomenon is the known Mössbauer effect \[38\] lying in the fact that the resonant absorption of \( \gamma \)-radiation by nuclei in conditions of partial overlap of emitted and absorbed \( \gamma \)-radiation lines rises sharply when cooling the radiation source and absorbent. Mössbauer had accounted for this strange (for the year 1958) effect by the fact that, in certain situations (sufficiently low transition energy, low temperature as compared with the Debye temperature of the crystal), the recoil momentum and energy produced during emission (absorption) of \( \gamma \)-quantum do not go into either knocking out an atom from a site of the lattice or changing the energy state of the crystal but are transmitted, in elastic manner, to the entire crystal or at least to a large group of atoms embraced by travelling acoustic wave during the emission time. In such a case, the correlation between the momentum and energy of the emitting (absorbing) nucleus breaks down since the recoil energy practically equals zero due to large mass of the crystal, and hence the \( \gamma \)-quantum energy difference between the emission and absorption lines practically disappears. The essence of the Mössbauer effect is that an oscillator being in the state with minimum energy can, within the framework of quantum model of solid body \[38\] solely acquire energy but cannot give it up.

An analogous pattern is observed also in the experiment of A.l.Leipunsky as well as in other ones, for instance, in decay of neutron:

\[
n \rightarrow p + e^- + \tilde{\nu}_e
\]

if assumed that the physical space is a certain periodic oscillating medium taking over the laws of conservation, i.e. one may not introduce into Expr. (4) the electron-type antineutrino as it was done by Pauli in order to meet the conservation laws, but therewith the event (4) may not already be considered as a local phenomenon.

Let us show that on the theoretical basis \[11, 12\].

The vacuum states \( II^+, I^+, I^-, I^-, II^- \) of the byuons appear randomly and are characterized for the byuon \( \Phi(i+1) = A_{\Phi} x(i+1) \) by special functions \( \Psi_{II^+}^{i+2}, \Psi_{I^+}^i, \Psi_{I^-}^{k-i-2} \) and \( \Psi_{II^-}^{k-i} \), respectively. Under the product \( \Psi_{II^+}^{i+2} \Psi_{I^+}^i \) is meant, in Refs. \[11, 12\], the probability of existence of vacuum states \( II^+ \) and \( I^+ \) of byuons with the index \( (i+1) \). Recall that the vacuum state \( II^+ \) increases the index \( i \) of a byuon, i.e. the value \( x(i+1) \), by one, and the vacuum state \( I^+ \) decreases it by one. Normalizing the functions \( \Psi_{II^+}^{i+2}, \)

\[\text{The solid body is a set of harmonic oscillators } \[38\].\]
Here $N, k, P$ are periods of byuon interaction in $i$, they are computed precisely in Refs. [12, 17] based on the minimum potential energy of byuon interaction in $R_1$ ($N, k, P$ are integer numbers equal to $1.54 \cdot 10^4, 3.2 \cdot 10^{15}, 10^{42}$, respectively). To these periods there correspond the distances $k \tilde{x}_0 \approx 2.8 \cdot 10^{-17} \text{cm} \approx 3 \cdot 10^{-17} \text{cm}; Nk \tilde{x}_0 \approx 10^{-13} \text{cm}; NkP \tilde{x}_0 \approx 10^{-28} \text{cm}$, where $\tilde{x}_0 \approx 2.8 \cdot 10^{-33} \text{cm}$ is a quantum of space such as $\tilde{x}_0 / \tau_0 = c$ ($c$ is speed of light, $\tau_0 \approx 0.9 \cdot 10^{-43} \text{s}$ is a time quantum).

It turned out to be remarkable and surprising that, for the four-contact interaction of byuons (4B-objects) when at a single discrete point of the discrete one-dimensional space $R_1$ byuons can be observed at a time (i.e., in quantum of time $\tau_0$) in four vacuum states $II^+, I^+, I^-, II^-$, the equation for the $\Psi$-function has, for those states, the form of that of harmonic oscillator [12]:

$$\sum_{\xi=0}^{(NkP-k)/2} j=i \sum_{j=0}^{N\Psi_{I^+}}^{N\Psi_{I^-}} \Psi_{I^+}^{NkP-j-2\xi} \Psi_{I^-}^{NkP-j-2\xi} = \frac{NP}{2} \tag{5.1}$$

$$\sum_{\xi=1}^{(NkP-k)/2} j=i \sum_{j=0}^{N\Psi_{II^+}}^{N\Psi_{II^-}} \Psi_{II^+}^{NkP-j-2\xi} \Psi_{II^-}^{NkP-j-2\xi} = \frac{NP}{2} \tag{5.2}$$

$$\sum_{\xi=0}^{(NkP-k)/2} j=i \sum_{j=0}^{N\Psi_{I^+}}^{N\Psi_{I^-}} \Psi_{I^+}^{NkP-j-2\xi} \Psi_{I^-}^{NkP-j-2\xi} = \frac{NP}{2} \tag{5.3}$$

$$\sum_{\xi=0}^{(NkP-k)/2} j=i \sum_{j=0}^{N\Psi_{II^+}}^{N\Psi_{II^-}} \Psi_{II^+}^{NkP-j-2\xi} \Psi_{II^-}^{NkP-j-2\xi} = \frac{NP}{2} \tag{5.4}$$

Here $N, k, P$ are periods of byuon interaction in $i$, they are computed precisely in Refs. [12, 17] based on the minimum potential energy of byuon interaction in $R_1$ ($N, k, P$ are integer numbers equal to $1.54 \cdot 10^4, 3.2 \cdot 10^{15}, 10^{42}$, respectively). To these periods there correspond the distances $k \tilde{x}_0 \approx 3 \cdot 10^{-17} \text{cm}; Nk \tilde{x}_0 \approx 10^{-13} \text{cm}; NkP \tilde{x}_0 \approx 10^{-28} \text{cm}$, where $\tilde{x}_0 \approx 2.8 \cdot 10^{-33} \text{cm}$ is a quantum of space such as $\tilde{x}_0 / \tau_0 = c$ ($c$ is speed of light, $\tau_0 \approx 0.9 \cdot 10^{-43} \text{s}$ is a time quantum).

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$$\Delta(\Psi_{II^+}^{i+1} + \Psi_{II^+}^{i+1}) + (\Psi_{II^+}^{i+1} + \Psi_{II^-}^{i+1}) = 0, \tag{6.1}$$

$$\Delta(\Psi_{II^-}^{k-P-i-1} + \Psi_{II^-}^{k-P-i-1}) + (\Psi_{II^-}^{k-P-i-1} + \Psi_{II^-}^{k-P-i-1}) = 0, \tag{6.2}$$

Here $\Delta$ denotes second finite differences in index $i$. It is seen from Eqs. (5) that the object 4B is determined with probability 1 on the characteristic dimension in $R_3$ equal to $10^{-17} \text{cm}$ (the completion of forming $R_3$). It was shown in Ref. [11] that the charge and quantum numbers of elementary particles are formed on distances of $10^{-17} \div 10^{-13} \text{cm}$, and to the free object 4B corresponds in $R_3$, in accordance with the Heisenberg uncertainty relation, an uncertainty in coordinate equal to $10^{-28} \text{cm}$ [11].

The residual, from minimization process, potential energy in $R_1$ is considered in Refs. [11, 12] as a rest energy $mc^2$ in $R_1$. The energy of the object 4B equivalent to $mc^2$ is equal to $E_{kmin}^0 \approx 33 \text{eV}$. This object is a boson with spin 1, there corresponds a pair of electron-type neutrino-antineutrino ($\nu_e \leftrightarrow \bar{\nu}_e$) to it. The neutrino is a spinor produced by the interaction of byuons in VS $II^+I^+$, but its $mc^2$ is imaginary. The smeariness of objects 4B over the Universe gives the observed density of substance $\approx 10^{-29} \text{g/cm}^{-3}$ and connects all the objects of the Universe into a single information field.

Let us return to reactions of (4)-type. Thus it is stated that the momentum, energy, spin, and lepton charge attributed to the antineutrino are given up, when the reaction (4) proceeds, to the physical space formed as a result of minimizing the potential energy of byuons in $R_1$ and observed by us as an assemblage of the objects 4B which is developing constantly due to the vacuum state $II^+$ and creating an oscillating system.
being in the lowest energy level. Well, but what of the experiments with direct detection of neutrino which particle is observed repeatedly in leading nuclear laboratories in the world (for example, the known experiment of Cowen and Rayness [34, 35]):

$$\bar{\nu}_e + p \rightarrow n + e^+$$  \hspace{1cm} (7)

An answer is simple. The nuclear reactors near which the reaction (7) is observed due to the reaction (4), create around themselves an unobservable field of objects produced during interaction of byuons in the vacuum states $I^+I^-$ (antineutrino), which objects in turn, when connected with the objects created by byuons in the vacuum states $I^+I^+$, give bosons being in the vacuum states $I^+I^+I^-I^-$. The assemblage of these bosons forms the physical space, or the space of the elementary particles. The laws of conservation are therewith met to a high accuracy, however not in a local form but in a volume with a characteristic dimension of $\approx 10^5$ cm. Let us show this.

According to the basic hypothesis (1) the objects $4B$ forms, as said above, the interior space of an elementary particle along with all its quantum numbers and charges. Therefore this object always creates, due to its perpetual dynamics in the space $R_3$, the minimum momentum for an elementary particle as an integer entity whose interior geometrical space is formed by it. The momentum of the object $4B$ corresponding to the minimum one for elementary particles, may be represented in a general form [11, 12, 39]

$$p = \Phi E_{kmin}^0/c$$

where $\Phi$ is probability of detecting the object $4B$ in some region of the space $R_3$. If the objects $4B$ are free (i.e. not an elementary particle but a space free of elementary particles is created by them), then

$$\Phi = \frac{1}{16} \frac{x_0^3}{4\pi x_0^2}$$.  \hspace{1cm} (8)

In this case, if the spread in values of momentum for an elementary object $\Delta p$ is set equal $P$, the uncertainty in coordinate in $R_3$ for the object $4B$ will comprise $10^{28}$ cm. The coefficient $1/16$ in the formula for $\Psi$ is determined from the combinatorics of the byuons in the vacuum states $I^+, II^+, I^-, II^-$. If the object $4B$ is not free (i.e. it forms the interior geometry of an electron, as an example), then

$$\Phi = \frac{1}{16} \frac{x_0^3}{4\pi (Nx_0)^2}$$

and for an assemblage of $N$ objects $4B$ forming an electron (for which $m_e c^2 = NE_{kmin}^0$) we may write

$$\Delta p = \frac{1}{16} \frac{x_0^3}{4\pi (Nx_0)^2} \frac{NE_{kmin}^0}{c} = \frac{1}{64\pi} \frac{E_{kmin}^0}{Nc}.$$  \hspace{1cm} (9)

When using Eq. (9), we have, for $N$ objects $4B$, an uncertainty in coordinate $\Delta x$ on the order of 10 cm in $R_3$, i.e. an electron, due to wave properties of $N$ objects $4B$, carries information on its properties not over distances of $10^{-8}$ cm (de Broglie wave at the temperature $\sim 300K$) as in the case if it were considered as a pointwise particle, but at distances of the order of 10 cm. If one considers not $N$ objects $4B$ in an electron

\textsuperscript{3}The self energy is imaginary.
but only one object 4B (however in an electron, i.e. $\Phi$ is determined by formula (8)) then $\Delta x \approx 10^5$ cm. Thus a lesser quantity of information on the state of interior space characteristic of an electron has a greater spread in coordinate. Hence in the range of uncertainty in coordinate $\sim 10^5$ cm around an electron and consequently a neutron, the processes associated with transmitting energy, momentum etc, to the free space as well as to other objects in accordance with the reaction (4) and (7) can occur. As is seen, the overlapping of the processes (4) and (7) is tremendous if the reaction (7) is detected even at a distance of hundreds meters from the reactor, which, let us underline it once again, is in perfect analogy to the resonant absorption of $\gamma$-radiation by nuclei and to the Mössbauer’s effect as well, however not in coordinates $\Delta E, \Delta t$, but $\Delta p, \Delta x$. One can do therewith a simple estimation of the cross-section of the reaction (7) using our approach if to represent it in the form $\sigma = 1/n\lambda$ where $n$ is concentration of nucleons in a nucleus, and $\lambda$ is the maximum uncertainty interval for the new information field of the nucleon which field makes possible the intersection of the reactions (4) and (7). When put $n = 10^{38} cm^{-3}$ and $\lambda \approx 10^5$ cm, as said above, then we have $\sigma \approx 10^{-43} cm^2$. 

As is known, just such a value of $\sigma$ is observed in the experiment with neutrinos from a reactor as well as found on the basis of standard phenomenological theories [38].

4 Experiment on influence of vectorial potential on $\beta$-decay rate.

Data for influence of changes in the physical space structure, and more precisely, in $A_\Sigma$ depending on the vectorial potentials of the Sun and Earth, on reactions like that in Expr. (4), are given in Ref. [40]. In Fig.1 is shown the time variation of decay number for Cs-137 preparation during runs of measurements of Apr.19-23, 1994. The experiment was based on the assumption that probability $W$ of $\beta$-decay is proportional to $A_g$ [33]. Hence, if we diminish $A_g$ by means of a vectorial potential, the Earth’s one for example, the decreasing in $\beta$-decay numbers must be observed. In Fig.1, the pronounced 24-hour cycles are seen (the deflection is equal to $6\sigma$ where $\sigma \approx 4307$ is standard deviation). The minimum number of decays corresponds therewith to 8-10 hours of Moscow time when the point of maximum decrease in the modulus of $A_g$ due to the Earth’s vectorial potential $A_E$ goes through the meridian of Sanct-Petersbourg (Russia) where the experiment was carried out, under the condition that the coordinates of the vector $A_g$ are: the right ascension $\alpha \approx 270^0 \pm 7$, declination $\delta \approx 34^0$ [26]-[31] (the second equatorial coordinate system). In Appendix are described the statement, procedure, and equipment of the experiment. The results of the experiment carried out confirm that the physical space is a complex formation, and its “breathing” tells, through the potentials, on such a fundamental phenomenon as $\beta$-decay which is influenced on, according to the existing standard physics, practically by no factors (pressure, magnetic and electric fields etc.) [11, 12]. Thus, according to the conception being developed on formation of physical space from a finite set of byuons, the invoking the Pauli’s hypothesis on the existence of neutrino is by no means necessary to explanation of weak interactions.

APPENDIX
In Ref. [18], the expressions for the vectorial constant $C_V$ and the axial one $C_A$ of weak interaction in terms of $A_g$, elementary electric charge $e$, and periods of byuon interaction, are found. These periods are determined in Refs. [12, 17] mathematically from the minimum potential energy of byuon interaction in the one-dimensional space formed by them ($x_0 \approx 10^{-17}$ cm is the period characterizing the completion of $R_3$ formation; $N x_0 = c t^* \approx 10^{-13}$ cm characterizes formation of elementary particle electric charge in space [12, 18]):

$$|C_V| = e |A_g| \frac{2 x_0}{c t^*} \frac{c t}{2 x_0} \cdot 2 x_0^3 = e |A_g| 2 x_0^3 \approx 10^{-49} \text{erg} \cdot \text{cm}^3,$$

$$|C_A| = \frac{1}{2} e^2 c t^* x_0 \approx 10^{-49} \text{erg} \cdot \text{cm}^3.$$

It is easy to show that $|C_V|$ and $|C_A|$ are proportional to $A_g^{-2}$ [33]. In Ref. [33] the following expression for probability $W$ of $\beta$-decay is obtained:

$$W \approx C_{V,A}^2 E^5 \sim |A_g|.$$

Because really in any point of space the summary potential $A_\Sigma < |A_g|$ and $W \sim A_\Sigma$ are existing, hence one can judge the possibility of influence of vectorial magnetic potential, for example, the Earth’s one ($\sim 10^8$ CGSE unit), on the $\beta$-decay rate from its variation. The experimental investigations on this subject were carried out in the State Technological University of St.-Petersbourg. The following equipment and methodology were used. The influence of the vectorial potential of the Earth on electroweak interactions was investigated by way of counting the number of decays realized of $\beta$-active preparations. To registrate the decays, the standard detecting units BDEG-2-23 with the photomultiplier FEU-82 and scintillograph (on NaI) with dimensions $\phi 63 \times 63$ mm and BDEG-2-20 with the photomultiplier FEU-49B and scintillograph (on NaI) with dimensions $\phi 150 \times 100$mm, were used. The units were fed from the high-voltage sources BNV-2-95 and VS-22. The signals from FEU entered the analysers BPA-94M (AI-1024) having the overall number of energy channels up to 4096. In some measurements, the number of registering channels was cut down to 1024 for reducing the idle time. All the equipment was fed on the stabilized voltage, which was monitored by the digital voltmeter V7-47. During extended measurements, the analyzer was computer-controlled as well as reading the integrals of events chosen in separate channels was. As test specimens, the $\beta$-sources GIK-1-4 with cobalt-60 (half-life period $T_{1/2} = 5.3$ years) having activity $\sim 5 \cdot 10^6$Bc at the instant of measurements and OSGI-2 with cesium-137 ($T_{1/2} = 29.7$ years, activity $\sim 10^6$ Bc), were used. The characteristic lines of $\gamma$-quanta after $\beta$-decay are, for Cobalt-60, 1.17 and 1.33 MeV. The preparation of Cesium-137 is more convenient for measurements since it has the single characteristic line of 0.06 MeV. The de-excitation time in the scintillograph using NaI is $\sim 250$ ns, nonetheless the ultimate load of the pulse analyzer AI-4096 without reduction in counting accuracy is limited by the value of $5 \cdot 10^4$ $\gamma$-quanta per second. Really, the counting rate in the course of measurements was no more than 16-25 thousands quanta per second. The maximum number of events recorded in one energy channel is limited by $\sim 65$ thousands. Therefore, in order to prevent overflows, especially in channels corresponding to characteristic lines, the exposure accumulation time was forced to be limited with

\footnote{The russian marks of the apparatuses are represented by english letters.}
∼ 400s for Co-source and ∼ 200s for Cs-source. It has been possible in this time to register ∼ 5 – 10 millions quanta, of which ∼ 25 – 70% fell on characteristic lines. However, taking into account that the total number of events (photons) registered is proportional to the number of β-decays, one may detect variations in decay rate from their fractional changes. The principal result of measurements for the Cs-137 preparation is shown in Fig.1. The value of oscillation was equal to 25 thousand photons (at the initial level of ∼ 18.6 millions per ∼ 16 min.) which corresponds to ∼ 6σ. The repetition of this effect during the entire cycle of measurements (Apr.19-23,1994) indicates that it is not accidental.

References

[1] Collected Scientific Papers by Wolfgang Pauli, eds. R. Kroonig, V.F. Weisskopf, vol.11, Wiley-Interscience, New York, 1316, (1964).
[2] R.G.H. Robertson, T.J. Bowles, G.J. Stephenson Jr., Wark, J.F. Wilkerson and D.A. Knapp, Phys. Rev. Lett., 67, 957, (1991).
[3] E. Holzschuh, M. Fritschi and W. Kundig, Phys. Lett., B287, 381, (1992).
[4] Ch. Weinheimer, M. Prsyrembel, H. Backe, H. Barth, J. Bonn, B. Degen, Th. Edling, H. Fischer, L. Fleischmann, J. U. Gross, R. Haid, A. Hermanni, G. Kube, P. Leiderer, Th. Loeken, A. Molz, R. B. Moore, A. Osipowicz, E. W. Otten, A. Ricard, M. Schrader and M. Steininger, Phys. Lett. B300, 210, (1993).
[5] H. Kawami, S. Kato, T. Ohshima, K. U. Kawai, N. Morikawa, N. Nogowa, K. Haga, T. Nagafuchi, M. Shigeta, Y. Fukushima and T. Taniguchi, Phys. Lett., B256, 105, (1991).
[6] Wolfgang Stoefffl and Daniel J. Decman, Phys. Rev. Lett., 75, 3237, (1995).
[7] A.I. Belesev, A.I. Bleule, E.V. Geraskin, A.A. Golubev, O.V. Kazachenko, E.P. Kiev, Yu.E. Kuznetsov, V.M. Lobashev, B.M. Ovchinnikov, V.I. Parfenov, I.V. Skaichev, A.P. Solodukhin, N.A. Titov, I.E. Yarykin, Yu.I. Zakharov, S.N. Balashov and P.E. Spivak, INR preprint 862/94, Moscow, (1994).
[8] J. Bonn, V.M. Lobashev and A. Swift, Neutrino-96, to be published by World Scientific.
[9] Rabindra N. Mahapatra, Shmuel Nussinov, hep-ph/9610311.
[10] G.J. Stephenson, T. Goldman and B.H.J. Mekellar, hep-ph/9603392.
[11] Yu. A. Baurov, in coll. work “Plasma physics and some issues of general physics”, Central Scientific Research Institute of Machine Building, 71, (1990), (in Russian).
[12] Yu.A. Baurov, Fiz. Mysl Ross., 1, 18, (1994).
[13] N.N. Bogolyubov, D.V. Shirkov, Introduction into the theory of quantized fields, Moscow, Nauka, (1976), (in Russian).
[14] T.H. Schwarz, Phys. Rept., 89, 223, (1982).
[15] M.B. Green, Surv. High Energy Phys., 3, 127, (1983).
[16] B.M. Barabashov, V.V. Nesterenko, UFN, 150, 4, 489, (1986).
[17] Yu.A.Baurov, V.V.Nikitin, in coll. work "Theoretical and experimental investigation of some issues of general physics", Central Scientific Research Institute of Machinery, 79, (1994), (in Russian).

[18] Yu.A.Babayev, Yu.A.Baurov, Moscow, Preprint INR Akad. Nauk SSSR, P-0362, (1984).

[19] Yu.A.Baurov, Yu.A.Babayev, V.K.Ablekov, Dokl. Akad. Nauk SSSR, 259, 5, 1080, (1981).

[20] Y.Aharonov, D.Bohm, Phys. Rev., 115, (1959), 3, pp.485-491.

[21] Y.Aharonov, D.Bohm, Phys. Rev., 123, (1961), 4, pp.1511-1524.

[22] Y.Aharonov, D.Bohm, Phys. Rev., 125, (1962), 6, pp.2192-2195.

[23] Y.Aharonov, D.Bohm, Phys. Rev., 130, (1963), 4, pp.1625-1632.

[24] M.Peshkin, A.Tonomura, The Aharonov-Bohm Effect., Berlin, Springer-Verlag, (1989), (Lecture Notes in Physics), p.154.

[25] G.N.Afanasjev, Fiz. elem. chast. i atom. yadra (EChAYa), v.21, 1, (1990), p.172-250; v.23, 5, (1992), pp.1264-1321.

[26] Yu.A.Baurov, E.Yu.Klimenko, S.I.Novikov, Dokl.Akad. Nauk SSSR, 315, 5, 1116, (1990).

[27] Yu.A.Baurov, E.Yu.Klimenko, S.I.Novikov, Phys. Lett., A162, 32, (1992).

[28] Yu.A.Baurov, P.M.Rjabov, Dokl. Akad. Nauk SSSR, 326, 1, 73, (1992).

[29] Yu.A.Baurov, Phys.Lett., A181, 283, (1993).

[30] Yu.A.Baurov, A.V.Kopayev, hep-ph/9701363.

[31] Yu.A.Baurov, A.A.Efimov and A.A.Shpitalnaya, qr-qc/9606033.

[32] Yu.A.Baurov, A.V.Chernikov, qr-qc/9607002.

[33] Yu.A.Babayev, Yu.A.Baurov, Moscow, Preprint INR Akad. Nauk SSSR, P-0386, (1985).

[34] A.I.Alikhanov, Weak Interaction. Modern investigation of β-decay, Moscow, (1960), (in Russian).

[35] Allen J., Neutrino, transl. from English, Moscow, (1960).

[36] Reiness F., Cowan C.L., Phys. Rev., 92, 830, (1953).

[37] Reiness F., Cowan C.L., UFN, 62, 391, (1957).

[38] K.N.Mukhin, Exp. Yad. Fizika, book 1, part 1, Energoatomizdat, 376, (1993).

[39] Yu.A.Baurov, K.A.Trukhanov, Fiz. Mysl Ross., 1, 107, (1995).

[40] Yu.A.Baurov, V.A. Shutov, Prikladnaya fizika, 1, 40, (1995).

[41] I.M.Ternov, V.F.Razgonov, O.F.Dorofeyev, JETF, 84, 4, 1225, (1983).

[42] A.I.Nikitov, V.I.Rigus, JETF, 85, 1 (7), 24, (1983).
Figure 1: Time variation of Cs-137 $\beta$-decay: $n$ - the number of decays per 16 min, $t$ - the time of the day (St.-Petersbourg)