Structure of Physical Space and Nature of de Broglie Waves (Theory and Experiment)

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ABSTRACT. On the basis of the theory of formation of the physical space from a finite set of special discrete objects, byuons ($\Phi(\mathrm{i})=\mathbf{A}_{\mathrm{g}}\,\mathrm{x(i)}$ where $\mathbf{A}_{\mathrm{g}}$ is the cosmological vectorial potential, x(i) is the quantum number of the byuon, its "length" – positive or negative value having dimensionality cm.; i = 0,1,2,...,k...), the origin of de Broglie waves and of Heisenberg's interval of uncertainty, is explained at a qualitative level.

The existence of a new quantum information channel (QIC) associated with an assumed new force caused by the vector $\mathbf{A}_{\mathrm{g}}$, is predicted. Given are the results of last experiments on investigating the properties of the new force and QIC on the basis of long-term observations of changes in the intensity of the β-decay of radioactive elements, and in the behaviour of two quartz resonators spaced 0.7m apart. Some results of a yearly experiment with a quartz gravimeter "Sodin" and a magnet attached to it, are presented. In this experiment, signals of a new nature satisfactorily explained on the QIC basis, are detected.

1 Introduction

The hypothesis of Louis de Broglie that the wave-particle duality should be characteristic not only of light but also of electron as well as any massive particles, is the cornestone of quantum mechanics. *What is its nature? What is the nature of the Heisenberg's uncertainty interval?* These questions excite the mind of physicists over the century. One of the answers was the complementarity principle according to which the action of an observer onto a microobject cannot be reduced to zero (Heisenberg, Bohr, etc.) The majority of modern physicists do believe that the nature of quantum mechanics is in not yet known laws of the microworld.

All modern models in the physics of elementary particles and quantum field theory are built in ideology of gauge fields on the basis of more and more increasing symmetries: quantum chromodynamics [1,2], supersymmetric models [3,4], superstring models [3,5]. But to obtain the observable world (of massive particles) one is forced to use, in all above listed models, the method of spontaneous violating of symmetry (Higgs mechanism). It should be noted that the space in which events are evolving (the four-dimensional, ten-and more-dimensional space), is always given in those models.

In Refs. [6-8], the author followed another path. It was assumed that from a one-dimensional "anisotropic" world of special discrete objects, byuons, as the result of their dynamics, a nearly isotropic three-dimensional world appears with some insignificant residual spatial anisotropy (10^{-15}) caused by an initially built in anisotropic property of original objects. The residual anisotropy in the originated three-dimensional world allows the discrete world of byuons to evolve to the surrounding nature.

Consider properties of the model [6-8] from the standpoint of justifying the L. de Broglie's hypothesis and the nature of the quantum mechanics.

2 About the theory of byuons

Let us assume that the notions of the physical space, time, world of elementary particles do not yet exist but there exists a finite set of discrete objects, byuons, having an intrinsic vectorial property. The byuons $\mathbf{\Phi}$(i) (i=0,1,2,..k. . .) have the following form:

$$\Phi(\mathrm{i})= \mathbf{A}_{\mathrm{g}}\mathrm{x}\ (\mathrm{i}).$$

Here x(i) is the "length" of the byuon, a real (positive or negative) value depending upon the index i (the quantum number of Φ(i). The vector $\mathbf{A}_{\mathrm{g}}$ characterizes the internal dynamics of the byuon and indicates the direction of increasing the index i. By dimensionality it is some vectorial potential taking only two values of magnitude:

$$\vec{A}_g = \begin{cases} A_g, \\ -\sqrt{-1}\cdot A_g, \end{cases}$$

where A_g is the modulus of the cosmological vectorial potential, a new fundamental vectorial constant introduced in Ref.[9-11], $|\mathbf{A}_g| = 1{,}95 \cdot 10^{11} Gs \cdot cm$.

Thus, Φ(i) can take both real and pure imaginary values.

According to this conception, by the discrete time is meant, for the byuon, a discrete change in the index i (its increase or decrease). In connection with the discrete time, a quantum of time τ_0 and quantum of space $\tilde{x}_0$ are introduced in the one-dimensional discrete space R_1 formed by byuons ($\tau_0 = 0.9 \times 10^{-43} s$, $\tilde{x}_0 = 2.8 \times 10^{-33} cm$). The distance between byuons in R_1 is defined therewith as a difference in their lengths x(i). The space R_1 is discrete by definition.

Depending on whether the vector $\mathbf{A}_g$ is real or imaginary, the length x(i) positive or negative, decreases or increases in magnitude, free byuons (i.e. not interacting one with another) can be only in one of the four so called vacuum states (VS) II^+, I^+, I^-, II^-.

Introduce the following definitions.

1. A free byuon is in the state II^+ if its positive length discretely, in a quantum of time τ_0, increases by a quantum of distance $\tilde{x}_0$ with the speed of propagation (increase in length) $c = \frac{\tilde{x}_0 - 0}{\tau_0} = c_0$ (c_0 is light speed).

2. A free byuon is in the state I^+ if its positive length discretely, in a quantum of time τ_0, decreases by $\tilde{x}_0$. In this case $c = \frac{0 - \tilde{x}_0}{\tau_0} = -c_0$.

3. A free byuon is in II^- if the modulus of its negative length increases by $\tilde{x}_0$ in time τ_0 with $c = \frac{-\tilde{x}_0 - 0}{\tau_0} = -c_0$.

4. A free byuon is in I^- if the modulus of its negative length discretely, in time τ_0, decreases by $\tilde{x}_0$. In this case $c = \frac{0 - (-\tilde{x}_0)}{\tau_0} = c_0$.

In the physics considered [6-8], only three numbers $\tilde{x}_0$, τ_0 and $|\mathbf{A}_g|$, are introduced. The other properties of the surrounding world (the fundamental constants h, c_0, e; constants of interactions; masses of elementary particles, etc.) appear in the process of the dynamics of byuons on the basis of the following hypothesis.

Assume the observable three-dimensional space R_3 to appear as a result of minimization of the potential energy (PE) of byuon interaction in the one-dimensional space R_1 formed by them. More precisely, the space R_3 is fixed by us as the result of this byuon dynamics. In the space R_3, the dynamic processes for objects with the residual positive potential energy of byuon

interactions originate, and in consequence, the wave properties of elementary particles arise.

In the present paper we center on the last statement. The rest can be known from Ref.[6-8]. VSs of the byuons originate randomly.

Functions of index i are introduced characterizing the origin of such or another VS by byuons: $\Psi^{i+2}_{II^+}, \Psi^{k-i}_{II^-}$ determining the processes of byuon length magnitude origination and increase at positive and negative x(i), respectively; $\Psi^{i}_{I^+}, \Psi^{k-i-2}_{I^-}$ determining the processes of byuon length magnitude cancellation and decrease at positive and negative x(i), respectively.

The physical sense of the introduced functions consists in that their product determines the probability of two-contact interaction of byuons (for example, $\Psi^{i+2}_{II^+} \cdot \Psi^{i+2-k}_{II^+}$ determines the probability of interaction of byuons $[Ax]^{i+2}_{II^+}$ and $[Ax]^{i+2-k}_{II^+}$), the product of four functions determines the probability of four-contact interaction, the product of eight functions gives the probability of eight-contact interaction. These products should be positive, and in this case only they can describe an observed event. The probability of the single event is no greater than 1.

Depending on which range is i in ($0 \leq i < k, k < i < Nk, Nk < i < NkP$ where k, N, P are the assumed periods in i), various types of contact interactions between byuons may be introduced, and hence the normalization of the introduced functions should be dependent on i. See [6, 7, 8] for more detail.

In Ref.[6-8], k,N,P are calculated from the minimum PE and with the aid of the information theorem suggesting that the amount of information is kept constant in going from R_1 to R_3. The quantities are

$$\tilde{x}_0 k \approx 10^{-17} cm; \quad \tilde{x}_0 kN \approx 10^{-13} cm; \quad \tilde{x}_0 kNP \approx 10^{28} cm.$$

In [6, 7, 8] equations in terms of $\Psi-$functions, describing the propagation of four-contact interaction of byuons, are obtained:

$$\Delta[\Psi^{i+1}_{II^+} + \Psi^{i+1}_{I^+}] + \Psi^{i+1}_{II^+} + \Psi^{i+1}_{I^+} = 0, \tag{1}$$

$$\Delta[\Psi^{NkP-i-1}_{II^-} + \Psi^{NkP-i-1}_{I^-}] + \Psi^{NkP-i-1}_{II^-} + \Psi^{NkP-i-1}_{I^-} = 0, \tag{2}$$

where Δ denote the second finite differences in index i.

It is seen from Eqs.(1) and (2) that the process in i is of oscillatory character for the functions $(\Psi^{i+1}_{II^+} + \Psi^{i+1}_{I^+})$ and $(\Psi^{NkP-i-1}_{II^-} + \Psi^{NkP-i-1}_{I^-})$.

The entire set of points of the space R_1 breaks down into {A} where we cannot introduce interaction of byuons without violating the axiomatics of their VSs, and {D} where the interaction between byuons with PE>0 can be introduced. That is, at least two byuons are present in this case for a quantum of time in some cell of R_1, PE of these byuons is greater than zero.

The solution of the equations (1,2) characterizes the behaviour of points {A}. It is shown in Refs. [6-8] that in R_1 the process of renumeration of points is permanently going according to the VS-dynamics of byuons.

For example,

at a time point $\tau_{i+1} \begin{cases} \{D\} = i+1, i-1, ... \\ \{A\} = i+2, i, ... \end{cases}$

at a time point $\tau_{i+1} + \tau_0 \begin{cases} \{D\} = i+2, i, ... \\ \{A\} = i+3, i+1, ... \end{cases}$

The above said is partly confirmed by the equations (1,2).

Through the set {A}, information exchange occurs between points of the set {D}, which is the main mechanism determining physical essence of Heisenberg's uncertainty interval in the conception of physical space and vacuum under review. Without introducing the points {A}, the connection between D-points is realized in one direction only, in that of increasing index i with the speed no greater than c_0.

According to the developed conception of physical vacuum structure, we can determine momentum and a coordinate of such a complex object as an elementary particle. That is, writing the uncertainty relation in R_3 for some elementary object γ as $\Delta P \cdot \Delta X \geq h/2$, we mean ΔP and ΔX to be caused by the process of R_3 formation from byuons, i.e. determined by values of momentum of the points {D} in R_1 and by distances between the points {D} and {A}. The minimum momentum in R_3 can be also estimated as approximately equal to $\dfrac{\tilde{x}_0^3}{4\pi x_0^2 \tilde{x}_0} \cdot \dfrac{E^0_{k,min}}{c_0}$ ($\dfrac{\tilde{x}_0^3}{4\pi x_0^2 \tilde{x}_0}$ is the estimate of probability of an event of four-contact byuon interaction in the elementary volume $\tilde{x}_0^3$ in R_3) [6-8]. From the uncertainty interval we have then $\Delta X \approx 10^{28} cm$. This value ΔX give to us the possibility to obtain the density of matter in the Universe, observed in experiment, by way of averaging it over the sphere $10^{28} cm$ in radius ($\approx 10^{-29} g \cdot cm^{-3}$).

Thus the nature of the de Broglie wave is explained, in the framework of the byuon model, by the process of formation of the physical space of the elementary particle. At that the behaviour of the elementary particle itself may serve as a peculiar kind of "detector" of signals of new nature going through the structure of physical space (vacuum).

Let us explain the above said.

As opposed to gauge models, the potentials of existing fields become measurable quantities in the framework of the byuon model [6-8] with the masses of elementary particles being proportional to the modulus of a summary vectorial potential $|\mathbf{A}_\Sigma|$. It comprises the vectorial potentials of all existing fields of natural and artificial origin. Note that for the interacting byuons, $\mathbf{A}_\Sigma$ instead of $\mathbf{A}_\mathrm{g}$ ($|\mathbf{A}_\Sigma| \leq |\mathbf{A}_\mathrm{g}|$) enters into their definition. Therefore, if $|\mathbf{A}_\Sigma|$ is lowered by the action of some current system, then, as it was assumed in Refs.[6-8,12-15] any material object placed into the region of the summary $\mathbf{A}_\Sigma$ will be influenced by the new force ejecting the object from the region of changing $\mathbf{A}_\Sigma$. As shown in Ref.[16], the new force acts over a cone with an opening of $\sim 90^\circ - 100^\circ$ around the vector $\mathbf{A}_\mathrm{g}$.

According to the recent data [16,17], the vector $\mathbf{A}_\mathrm{g}$ has the following coordinates in the second equatorial system: right ascension $\alpha \approx 293^\circ \pm 10^\circ$, declination $\delta = 36^\circ \pm 10^\circ$.

Because of an immense ($\sim 10^{28}$cm) interval of uncertainty of free objects 4b which form R_3 but not charge numbers of elementary particles, the changes in $|\mathbf{A}_\Sigma|$ are instantly transferred through the indicated distances connecting all objects of the nature into a single general information field. Therewith the basic information is determined by the character of $\mathbf{A}_\Sigma$ changes (i.e. by the new force) being represented by a very great but finite number of coefficients of certain series [6-8].

3 Experimental investigations of a new quantum information channel (QIC)

The results of the experimental investigation of the new force are given in Refs.[6-8,12-15]. In the present paper we give only some latest data confirming the presence of QIC.

In was shown in Refs.[6-8] that the new force is nonlocal and nonlinear and can be represented in the form of some series in $\Delta\mathbf{A}_\Sigma$. The first term of this series is

$$\mathrm{F} \sim \Delta\mathbf{A}_\Sigma(\partial\Delta\mathbf{A}_\Sigma/\partial x),$$

where x is the spatial coordinate.

All the below described experiments were patterned after following scheme. If a test body is placed into the region of considerable $(\partial\Delta\mathbf{A}_\Sigma/\partial x)$ created by a specially chosen magnetic system, and the value of the product $\Delta\mathbf{A}_\Sigma(\partial\Delta\mathbf{A}_\Sigma/\partial x)$ is sufficient (even for very small $\partial\Delta\mathbf{A}_\Sigma/\partial x$ at high $\Delta\mathbf{A}_\Sigma$ from natural sources due to the immense spatial scale of changes) then the new force acting upon the test body possibly can be measured.

In the Refs.[7,8,18-21], one used the neutron as a test body. Since it has a magnetic moment, and the value of $\partial\Delta\mathbf{A}_\Sigma/\partial x$ is on the order of 10^{16}Gs, the new force could be expected to act on the rate of the β-decay of radioactive elements because of changes $\Delta\mathbf{A}_\Sigma$ in time, for example, in the process of dayly and yearly rotation together with the Earth due to the influence of its vectorial potential ($|\mathbf{A}_\mathrm{E}| \approx 10^8 Gs\cdot cm$) and that of the Sun ($|\mathbf{A}_\odot| \geq 10^8 Gs\cdot cm$).

In Fig.1 shown are the results of an experiment [21] on simultaneous investigating changes in intensity of the β-decay of radioactive elements in two towns. The experiment was carried out at Institute for Nuclear Research of Russian Academy of Sciences (Troitsk) with ^{60}Co and at the same time at Joined Institute for Nuclear Research (Dubna, Russia) with ^{137}Cs, using germanium-lithium detectors.

The experimental technique (schematic diagram, electronic equipment, measurement of backgrounds) at Dubna was the same as in the experiment described in detail in Ref.[20], and differed from the latter only in that a Ge(Li)-detector (volume $\approx 100cm^3$) was used. As before (when using a scintillation detector), the intensities of γ-transition from an excited level of a daughter nucleus with an energy of 0.661MeV in the course of the β-decay of ^{137}Cs, was measured. The value of the integral of γ-quanta counts entered into the memory of a computer every 10s.

As distinguished from the technique of long-term measurements of β-decay rate with an scintillation detectors [18-20], the γ- registration following the β-decay of the investigated radioactive nuclei with a Ge(Li)-detectors made it possible to substantially improve the stability and reliability of long-term measurements. At Troitsk, a Ge(Li)-detector also with a volume of 100 cm^3 was used for measuring the γ-spectra with energies of 1.117MeV and 1.332MeV accompanying the β-decay of ^{60}Co. A radioactive source was placed beyond of the vacuum volume at a distance of 7mm from the sensitive surface of the detector. To protect the detector and preamplifier from the possible influence of alternating high-frequency and magnetic fields, they were closed by covers from permalloy and electrolytic copper, and a 10cm layer of lead served as a shielding from the natural radioactive background. The signal time constant of the input signal was equal to 0.5μs at a gain factor of 10-20 which led the influence of amplitude overload of electronic paths to a minimum.

To record the amplitude spectra, a fast ADC with off-line storage built into a personal computer (PC), was used. A control program gave the time of measuring each spectrum (600s), start time, storage instruction, noted the time of transcription of a next spectrum to the PC memory, zeroed the off-line storage, and started a new measurement. The program worked in a cycle so that the information sequentially accumulated in the memory of PC through a long time. The final processing of information was made off-line by integration over the spectrum in various intervals of energy from the first channel to the maximum energy of photopeak (or only the peak itself) with the resulting formation of a sequence of numbers reflecting the time dependence of the β-decay rate. The statistic-average digital load of the detector was no more than $(2\div3)\cdot10^4$counts per second, i.e. corresponded to the optimum working conditions of the instrumentation. The statistical accuracy obtained at a one point was 0.03% for the radioactive decay of ^{60}Co.

Thus the measurements were made simultaneously by two identical Ge(Li)-detectors with two independent and different systems of information storage in natural conditions spaced 140km apart. One detector measured the decay of ^{137}Cs, the other did that of ^{60}Co.

We can see from the Figure that, firstly, there are near-daily quasiperiodical β-decay intensity up to 0,7-0,8 % at Troitsk and up to 0,2 % at Dubna which are in themselves contradictory to existing views on constancy of coefficients of the β-decay.

The observed regular structure in the time dependence of the β-decay rate for nuclei ^{137}Cs and ^{60}Co can be, in general, explained by the following reasons:

a) temporal instabilities of the electronic recording paths;

b) outside influences and those connected with the human activity;

c) unknown physical processes in the Ge(Li)-detectors themselves in the course of long-term measurements;

d) a “cosmological” factor acting on the process of the β-decay of nuclei.

Consider each reason separately for the setup of Troitsk (that of Dubna, as was mentioned above, is considered in detail in Ref.[20]).

a) The structure of changes in the count rate is such that it cannot be explained by the slow variations of the supply-line voltage (220V). Besides, the low-voltage supply of the electronic circuits was stabilized with an accuracy of 3% and did not vary when the supply-line voltage was changed within 15%. As is known, the spectrometric characteristics of Ge(Li)-detectors practically do not depend on insignificant variations of high-voltage supply.

b) As for the structural changes in the β-decay count rate due to variations of some external influences, daily variations of intensity of cosmic radiation, changes in the room temperature, etc, we can say that the detectors themselves as well as the channels of electronic paths were carefully protected against variable, alternating, and leakage electromagnetic and high-frequency fields. The natural background of the Ge(Li)-detector was as little as about 0.1% of the β-decay count rate of the radioactive sources investigated. That is, only a periodical 7-8 times increase of the background could explain the structure observed in the β-decay count rate. But the count rate of the background was constant in the limits of the statistical accuracy. To evaluate experimentally a possible influence of count overloads (idle time) of the electronic paths when measuring the background, one simultaneously fed to the input of the preamplifier a signal from a generator with an amplitude equal to that of the photopeak but with frequency 50-100 times more than under the operating conditions. For such spectra, there were no peculiarities in the time dependence of the count rate.

c) It is possible that in the material itself of the Ge(Li)-detector some yet unknown physical processes take place during the long-term exposure to radiation which lead to accumulation of charge in "internal" capacities, then to a break-down and relaxation of charge. This would correspond to the observable structure form in the time dependence if the "time constant" were close to 24 hours. In such a case the amplitude spectrum of γ-quanta would be perturbed, too, in those intervals of time but this was not observed in the experiments. As to an influence of capacitive coupling in the amplifying section itself, control measurements were carried out with the use of non-capacitive current amplifiers, and a similar structure with the same value was found in the time dependencies obtained.

d) Finally consider a possible influence of the cosmological factor on nuclear processes on Earth. In Fig.1a,1b, the directions of action of the new force drawn tangentially to Earth's parallels of latitude at extremum points of β-decay intensity (that is, the directions of the vectorial potential of the Earth at these points) form three clearly distinguishable subsets of directions being in agreement for both setups. One of these directions coincides with the direction of $\mathbf{A}_{\mathrm{g}}$, and others lie on the above indicated cone of the new force. This result is discussed and explained in Ref.[21].

In connection with experiments of Ref.[21], the more than 40-year works of a known biophysicist S.E.Shnol with coworkers should be noted [22]. They have shown that in the course of successive measurements of any processes, a sequence of some discrete values is obtained every time due to fluctuations. At each moment, the form of sinchronous histograms is similar for the processes of different nature and at great distances between laboratories. In a series of successive histograms, a given histogram with a high probability is most similar to the nearest neighbours and is repeated with a period of 24 hours, 27 days, and about 365 days. All this is obliged, by Shnol's opinion, to a highly general cosmophysical cause of the phenomenon.

In recent years S.E.Shnol is concerned with the α- and β-decay of radioactive elements. In Ref.[21] is noted that the nearly 24-hour period in variations of α- and β-decay rate observed in experiments at the Institute of Theoretical and Experimental Biophysics. It is consistent with the results of our works [18-21]. The more immense experimental result, obtained by S.E.Shnol with his group, points to existence of the common mechanism of fluctuations which can be qualitatively explained on a basis of the byuon theory.

Fig.2 illustrates the results of an investigation of disturbances passing through QIC carried out with the aid of two quartz resonators. One of them was placed into the region with an increased value of $\partial \Delta \mathbf{A}_{\Sigma}/\partial x \approx 3.5 \cdot 10^3 Gs (B \approx 1 Gs$ at the point of its location), another was at a distance of 70cm from those region (calibration instrument). In this experiment [23] the change in the difference of quartz frequencies Δf in dependence on time was measured. The experiment lasted $\sim$ 1 year. In the Fig.2a, the directions of the new force also drawn tangentially to an Earth's parallel of latitude at the place of min Δf, are given. As is seen, the same three subsets of directions of the new force $\mathbf{F}$ as in the experiments with the β-decay, were observed.

In Fig.3, one of the results of a yearly experiment (in 2000) on the investigation of QIC with the aid of a high-precision quartz gravimeter Sodin [24], is given. The experiment was perfomed at the Schternberg State Astronomical Institute (SSAI) of Moscow University, at a special laboratory of gravimetry. Two gravimeters were used: one with an attached magnet (B $\approx$ 3000Gs on its surface) as an amplifier of new signals for creating the gradient of $\partial\Delta\mathbf{A}_{\Sigma}/\partial x$, another gravimeter without magnet. The main deviation in readings of the gravimeters was caused by the Moon tide. As is seen from the Fig.3, on the background of the moon tide some deviations are present. The events (1,3,4) were recorded by both gravimeters (these are earth-quakes), but the event (2) was only by the gravimeter with the magnet. This latter event was detected 5 min before the solar flare of very high intensity which was not observed in the last 40 years. (That is interesting in itself because the gravimeters should not respond to solar flares, much less foresee them). Within the year 2000 more than 10 such events with the duration up to 3 min and the amplitude of signal sometimes over that of the moon tide, were noted.

In the preceding experiment (1995-96) [7,8,25], the signals with the amplitude of 15 "moon tides" and duration up to 10 min were observed. All events except the second one (Fig.3) recorded by the gravimeter also lie on the cone of directions of the new force obtained in Ref. [16].The event (2) coincides, to $\pm 5^{\circ}$, with the above indicated direction of the vector $\mathbf{A}_{\mathrm{g}}$.

Thus it is seen from the experiments described that the same force is acting on various objects of the nature.

At the present time it is not yet clarified with what velocity the signal propagates, or, may be, the phenomenon is of quantum character (signal transmits without introducing the notion of velocity). But it is clear today that the new force acts upon the elementary particles, and the behaviour of them can give information on its magnitude.

4 Conclusions

As is seen from the above said, there are before unknown factors in nature which can influence on the behaviour of elementary objects. The main of them is possibly a "storming ocean" of the physical vacuum. In the framework of the byuon model, the "seething" of this "ocean" is caused by changes in the value of $\mathbf{A}_{\Sigma}$ entering into the definition of byuons. The existence of a finite value of momentum at objects 4b forming the physical space allows to explain qualitatively the de Broglie waves and the basic principle of the quantum mechanics – the Heisenberg's interval of uncertainty.

The author is grateful to prof. V.V.Dvojeglazov for the invitation to participate in the present publication, to academician of RAS S.T.Belyaev for the support of the investigations, and to all members of experimental groups at INR RAS (Troitsk, the chief Yu.V.Ryabov), at JINR (Dubna) (the chief Yu.G.Sobolev), and at SSAI of the Moscow University (the chief A.V.Kopajev) for their great work on investigating the properties of the new force. The author thanks also E.P.Morozov, L.I.Kazinova, and A.Yu.Baurov for help in preparing the text of the paper.

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(Manuscrit reçu le 12 septembre 2001)

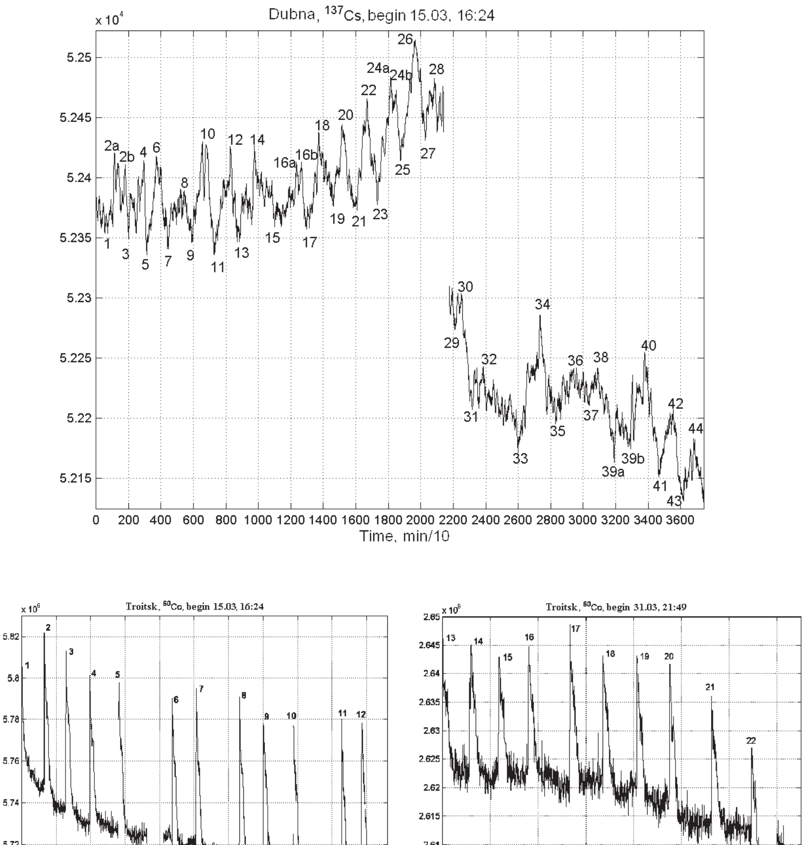

Fig.1. The variation of the flow of γ-quanta accompanying the β-decay of ^{137}Cs (JINR, Dubna), and ^{60}Co (INR, Troitsk), with the time (since 15.03.2000).

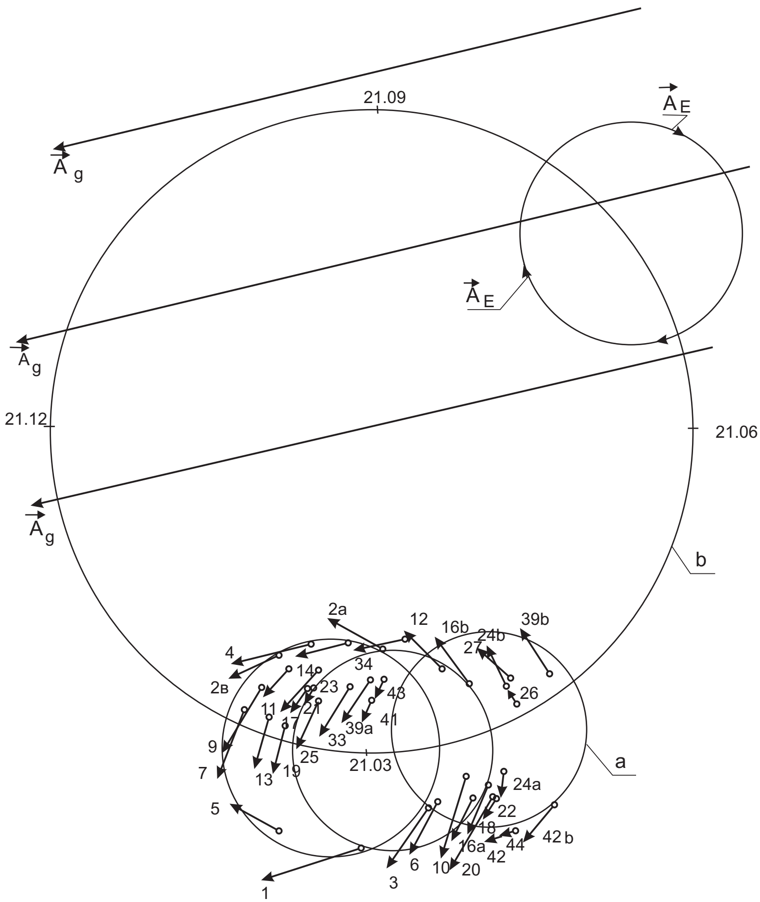

Fig.1a. The spatial positions of sites where the clearly expressed extrema in the magnitude of the flow of γ-quanta in the experiment with the β-decay of ^{137}Cs, were observed (see Fig.1).
←• - the site of the maximum flow of γ-quanta with the indication of the direction of action of the new force drawn along the tangent line to the parallel of latitude; **a** – the trajectory of motion of the radioactive source rotating together with the Earth; **b** – the trajectory of motion of the Earth and the radioactive source around the Sun; **21.03** etc. – the point of the vernal equinox and other characteristic points of the trajectory “b”;
$\vec{A}_E$ – the direction of the vectorial potential of the magnetic field of the Earth’s dipole; $\vec{A}_g$ – the direction of the cosmological vectorial potential.

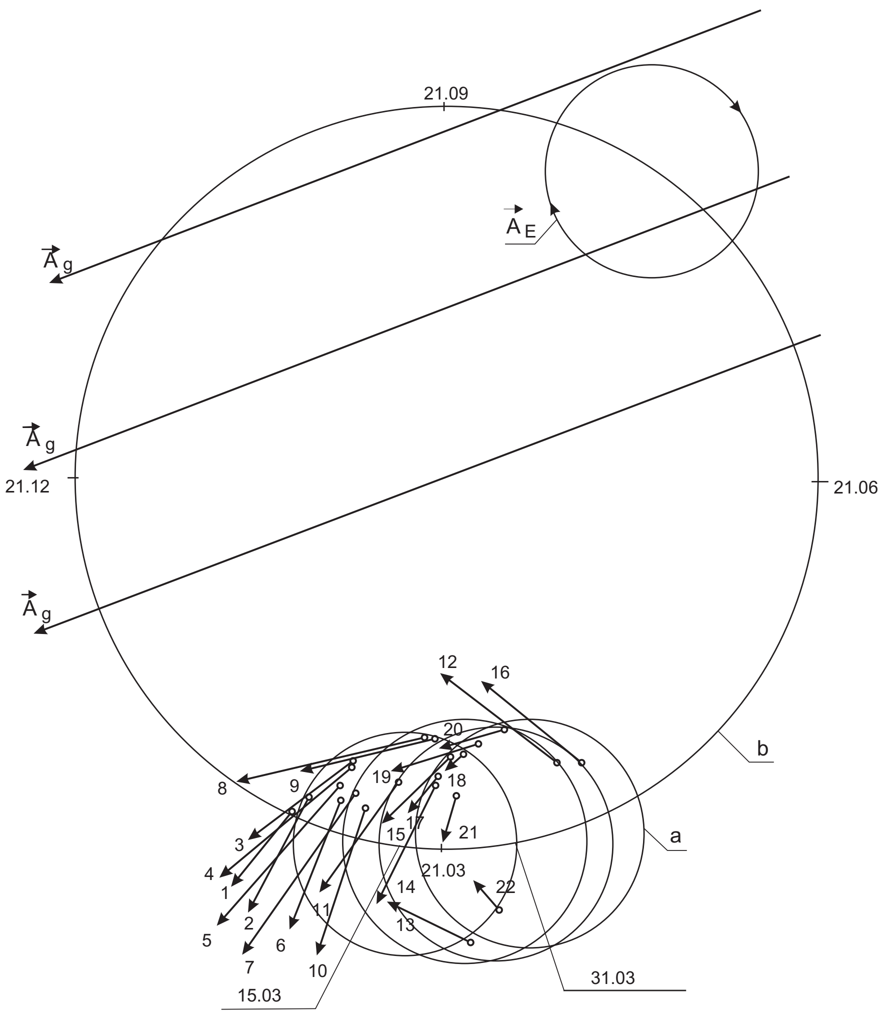

Fig.1b. The same as in Fig.1a but for maximum flows of γ-quanta during the decay of ^{60}Co (see Fig.1a).

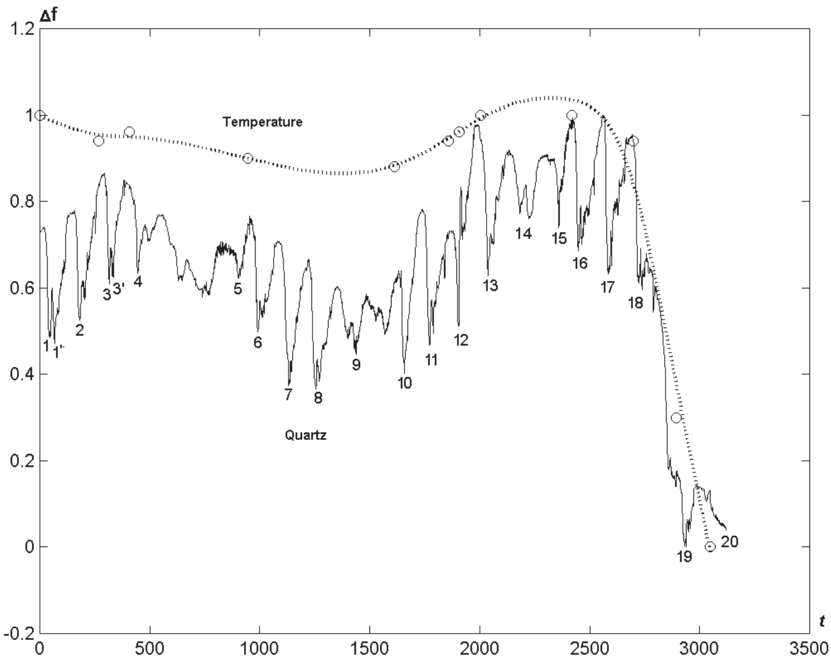

Fig.2. "Difference of quartz frequencies" Δf (s, time for difference in 1Hz) in dependence on time t (relative units of time from 01.11.2000 till 26.11.2000) with temperature recording.

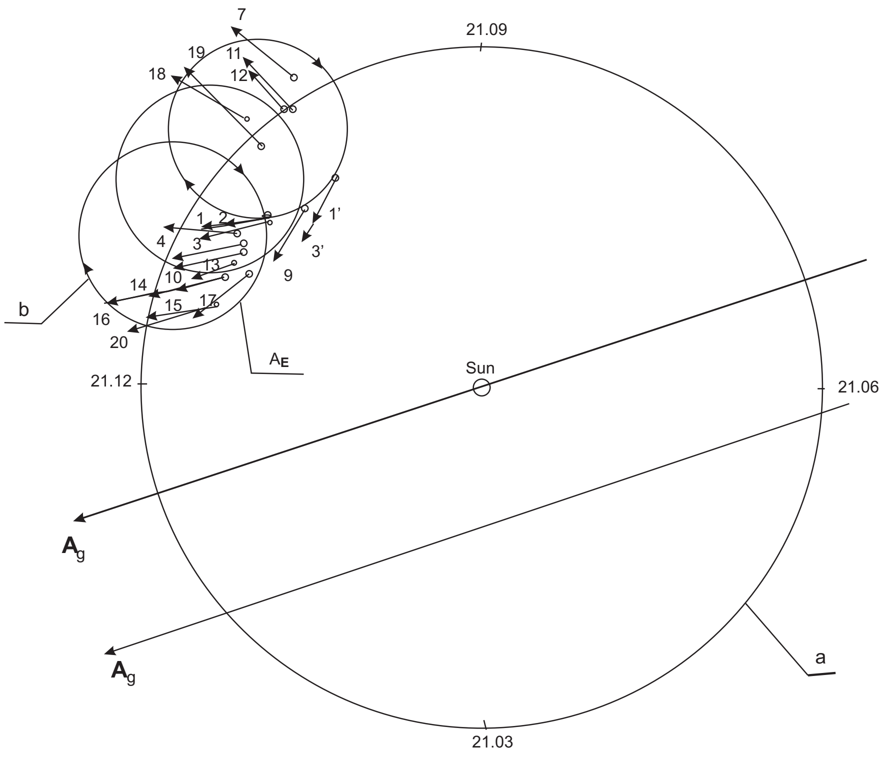

Fig.2a. The spatial positions of sites where the clearly expressed minimun of Δf (see Fig.2), other designations are the same as in Fig.1a,b.

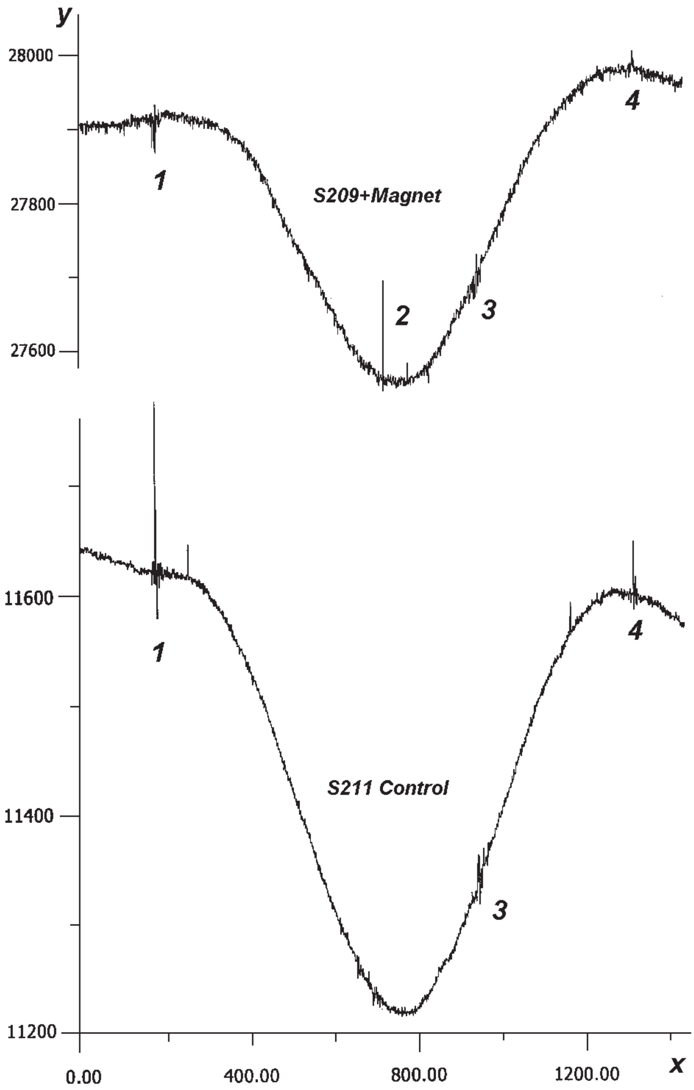

Fig.3. Readings of the gravimeters at at Jun.6.2000.
y - the displacement of platinum weight (one division is equal to 0.1μ and corresponds to $0.2\mu Gal$); x - time (in minutes), event (peak) at $12^h 1^m$ UTC.