

Low-energy nuclear reactions and the leptonic monopole

Georges Lochak*, Leonid Urutskoev**

***Fondation Louis de Broglie, Paris, France**

****RECOM, Kurchatov Institute, Moscow, Russia**

I. Transformation

Our report surveys the experimental and theoretical studies carried out at the RECOM since 1998 and the theoretical studies of leptonic monopole by Georges Lochak (Fondation Louis de Broglie). We'll outline briefly all the results to give the overall picture of our researches.

In 1998, to solve some applied problem, our research group studied the electric explosion of titanium foil in water. By pure accident, in mass-spectrometric analysis of the titanium powder formed after the electric explosion, we noted a pronounced distortion of the natural isotope composition of titanium. The principle of the experiment was as follows. Two banks of capacitors with the total energy store $W = 50 \text{ kJ}$ and the voltage $U = 5 \text{ kV}$ are discharged synchronously and independent of each other to two foil loads over time $t \sim 0,1 \text{ ms}$. Of course, during the long period of our studies, we employed different experimental block diagrams, and I cannot describe all of them. The most general experimental diagram is shown in Fig.1.

The Figure shows a half of the setup. The load is located in the explosion chamber, which is a leak-tight strong metallic container, whose internal structure is made of high-density polyethylene. The design of the explosion chamber includes facilities for the gas exhaust and bleeding-in and for taking gas samples into cylinders. The electrodes were made of high-purity titanium. As the operating fluid, we used either bidistilled water with an impurity level of 10^{-6} g/l or solutions of various metal salts in bidistilled water.

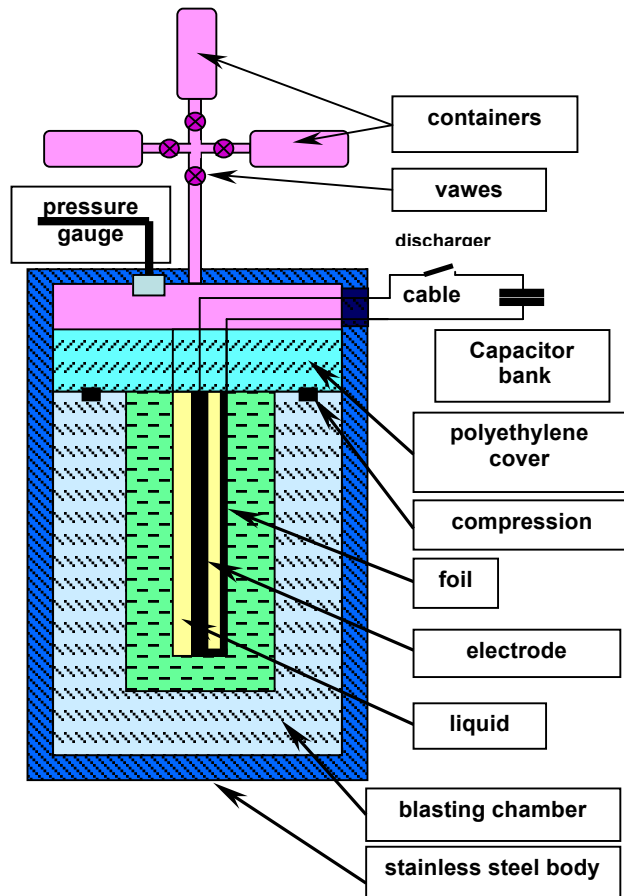


Fig 1.

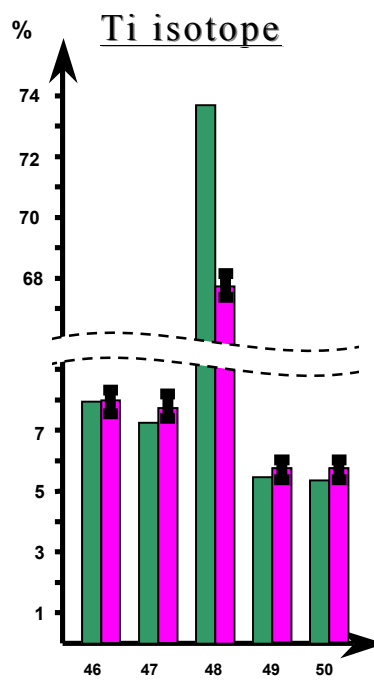


Fig 2.

The key result is as follows. The remainder of the titanium foil shows a distorted titanium isotope ratio (Fig. 2). It can be seen from the Figure that the situation looks as if ^{48}Ti “disappeared” at the instance of the pulse. Please, pay attention that the ^{48}Ti isotope was not transformed into another isotope but disappeared, while other isotopes remained approximately in the same proportion, of course, to within the error of measurements. The deficiency of ^{48}Ti in some experiments is $\sim 5\%$ while the error of measurements is $\pm 0.4\%$. Simultaneously with disappearance of ^{48}Ti , a sharp (ten-fold) increase in the impurity content in the samples was detected by mass-spectrometry, X-ray fluorescence analysis and so on. The percentage of the new impurities corresponded to the percentage of the lost ^{48}Ti . The chemical composition of the resulting foreign components is shown in Fig. 3. All the components that could be present from the beginning have been subtracted.

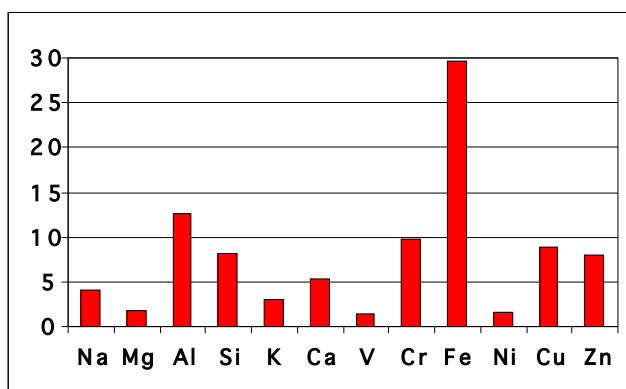


Fig 3.

I am not going to analyze the experimental results, as this analysis has been published in [1]. Nevertheless, the results were so unexpected that they called for an independent verification. This was done by our colleagues from Dubna (Kuznetsov’s group). The verification was thorough, and the results were published in [2]. An important result is that, unlike Fleischmann and Pons, we claim that no neutrons are observed in our experiments with the limitation on the neutron flux of $\dot{I} < 10^3$ per pulse. This is a weighty reason supporting the assumption that our “magical” nuclear transformations do not involve strong interactions.

Important also is one more fact found both in our experiments and in Kuznetsov’s group experiments. Neither of us observed any significant residual γ -activity in the samples. The lack of excited nuclei is important because this allows one to reject all hypothetical accelerative mechanisms for the observed nuclear transformations, because it is impossible to overcome the Coulomb barrier through an acceleration mechanism without exciting the nucleus. Similarly one cannot conquer a fortress by a forward storm without destroying the walls or gates. Nevertheless, the fortress has been conquered, as follows from the experiments. Hence, we should look for traces of undermining the wall.

You may ask how reliable are these results. Don’t they involve a procedural mistake? The answer is as follows: the data on the isotope shift were obtained independently on three types of mass spectrometers; hence, it is not an error of some particular mass spectrometer. Next, couldn’t this isotope shift result from an error inherent in mass spectrometry, for example, from a superimposition of lighter masses? The colleagues from Dubna verified our results on the isotope shift of ^{48}Ti using gamma-activation analysis. The idea was that nuclear transitions for titanium isotopes differ appreciably from one another and, therefore, they are

easily detectable. As it has been already noted, they got the same result – a loss of ^{48}Ti . Thus, a procedural error also can be ruled out.

Why do we have to discuss the isotope shift in so much detail? The reason is that exactly this fact attests to low-energy nuclear reactions. The mere detection of foreign chemical elements in a tightly sealed chamber could be attributed to admixtures of the materials that make up the device. Conversely, an isotope shift from the natural isotope ratio of a chemical element cannot be attributed to admixtures. Indeed, the admixtures must also obey the natural isotope ratio. An occasional isotope redistribution in a sample, first, contradicts the Second Law of Thermodynamics, because it implies a spontaneous decrease in the entropy. Second, the sample is thoroughly stirred prior to mass spectrometry and a random portion is taken every time. Therefore, we would have observed not only a decrease in the ^{48}Ti content in some samples, but also an increase in this content in other samples. However, this is not the case. Last year, at the colloquium in Paris organized by Fondation Louis de Broglie, a French colleague made a felicitous remark on this topic. He said: it looks as if an isotope revolution was going to cover the physics. If this is really the case, please, don't think that Russians or Frenchmen are again responsible for a revolution. Nothing of the kind - this revolution is obviously international. That is why we are here, in Marseille.

Let us turn again to the results of measurements shown in Fig. 3. I intentionally did not mark the errors in the chart, as this would complicate the understanding. The problem is that the accuracy of measurement is variable for different chemical elements. In some cases, this is 5%, in other cases, 10%, and for light elements, the error may reach 30%. However, this is not very important now. We can even consider this picture (Figure 3) semi-quantitative. Another fact is important, namely, one isotope (the parent atom), in particular, ^{48}Ti is not converted into particular one or two daughter isotopes of another chemical element or titanium, as would be expected from the views of known nuclear physics. Instead, it decomposes into a spectrum of daughter elements. This fact by itself suggests that we are dealing with a collective process, because one atom cannot decompose into a spectrum of other atoms, if for no other reason but the substantial difference in the nuclear binding energy.

Nevertheless, some words should be said about the procedural legitimacy of the determination of the composition of daughter chemical elements presented in Figure 3. Apart from mass spectrometry, X-ray fluorescence analysis and optical spectrometry methods were used for this purpose. All the results are in satisfactory quantitative agreement. I will not dwell on this point, as it has been described in detail in [1, 2].

Yet another problem, namely, the reproducibility of experiments is critical for the whole cold nuclear synthesis, and we will consider it here. The scatter of the electrical parameters of our setup (the current and the charge) from one experiment to another is about 15% with the same load. That this is a good result. The usual scatter for pulsed plasma devices is about 25%. We achieved a reproducibility of measurable physical parameters, for example, the isotope distortion of titanium, equal to $\pm 0.56\%$ and the pressure jump $\delta P/P$, equal to $\sim 1.1\%$. That is, the reproducibility of physical parameters is better than that of electrical parameters. Thus, our experiments show a rather high reproducibility. However, we must admit that in some cases, the effect of, for example isotope distortion increases several-fold for unknown reasons. These experiments are not reproducible, which may be due to some cosmological factor. This only means that we poorly understand the low-energy nuclear transformations. By the way, the presented charts (Fig. 2 and 3) do not include these "Olympic records."

However, despite all our reasoning, one can state that an effect actually exists if a parameter has been found whose change induces an enhancement of the effect. In this

particular case, the isotope shift. We were able to find such parameter. If glycerol is added to the bidistilled water, the titanium 48-isotope shift increases. Figure 4 shows the average ^{48}Ti isotope shifts for two series of experiments, one carried out in bidistilled water and the other, in glycerol. It can be seen from the Figure that the shift is greater in glycerol. However, if you ask why does it happen, we'll admit that we haven't found the reason as yet.

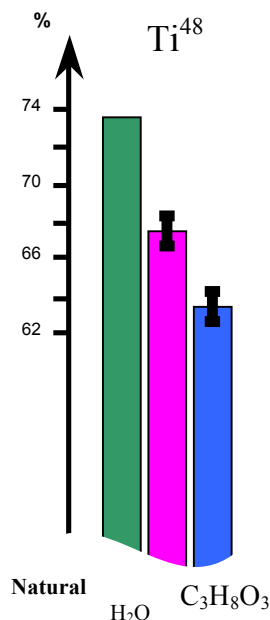


Fig 4

A rather interesting question is whether Ti is the only element to possess this remarkable feature. The answer is no — not only Ti. Experiments with other types of foil (Pb, Zr, Ta and so on) were carried out and isotope shifts were also detected. For example, the ^{208}Pb isotope is the parent atom for Pb. It is noteworthy that the tendency for transformation is usually found for even-even nuclei. Note that this is only an observation rather than a statement. We actually did not carry out systematic studies with other foils but concentrated on Ti. It should be borne in mind that, to attain significant effects in these experiments, it is necessary to thoroughly select the current, the weight of the load, and other parameters for each type of foil.

Nevertheless, the data obtained are sufficient for claiming that each chemical element is transformed to give its own spectrum of chemical elements.

The question of the isotope ratios of the chemical elements formed upon the transformation also cannot be passed over in silence.

For the vast majority of chemical elements, we did not notice significant distortions of the isotope composition with respect to the natural distribution. This offers hope that we, thanks God, haven't invented anything but only came across a natural phenomenon.

In order to complete the story of transformation, we should discuss the problem: where does the transformation take place, either throughout the whole space of the explosion chamber or only in the plasma channel? To answer this question, we carried out experiments with uranium salts (uranyl sulfate, UO_2SO_4) [3].

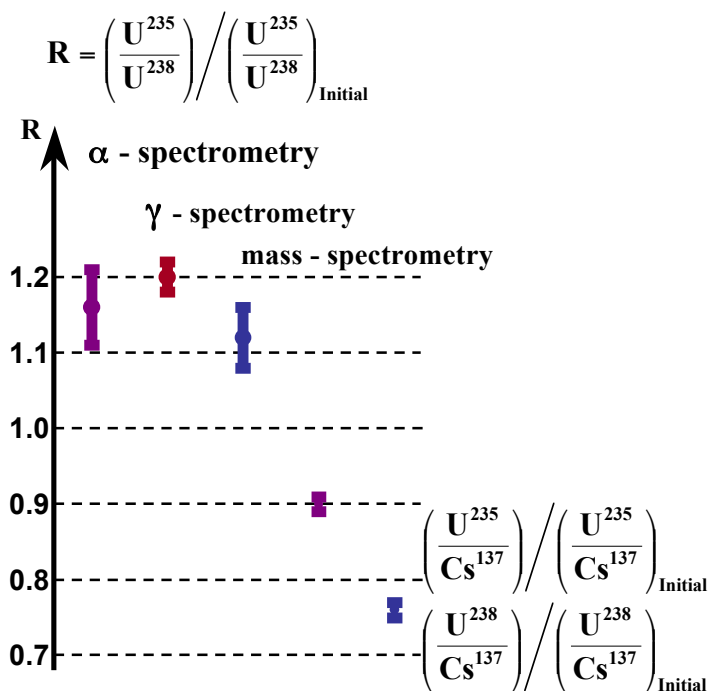


Fig 5.

The idea of the experiment was as follows. The plasma channel has a small volume with respect to the volume of the whole chamber. Thus, if some salt of a metal having several isotopes is added to bidistilled water, the number of admixture atoms from the solution that get to the plasma channel would be small compared to the number of Ti atoms. It is clear that recording of the isotope shift of admixture atoms would indicate that transformation takes place throughout the whole bulk of the chamber. As this metal, we used U. Uranium has two isotopes, ^{235}U and ^{238}U , whose ratio can be easily measured even at a low specific concentration by means of γ , β and α -spectrometry. Figure 5 shows the $^{235}\text{U}/^{238}\text{U}$ ratios measured by various procedures and referred to the same ratio measured in the starting solution. Thus, if no changes were detected after the experiment, this ratio would be equal to unity. It can be seen from the Figure that the real ratio is far from unity. The isotope shift effect extends far beyond the possible errors. The shift occurs toward enrichment of the mixture in the ^{235}U isotope. This does not mean that ^{238}U is converted into ^{235}U . This interpretation is wrong. We added some ^{137}Cs isotope as the marker. Then we measured the specific (that is, divided by the volume) activity of each U isotope with respect to the Cs activity before and after the experiment. It was found that the activity of both U isotopes decreased with respect to that of Cs. However, the activity of the ^{238}U isotope decreases to a greater extent. Thus, the ratio of ^{235}U to ^{238}U becomes bigger than unity. Prior to these experiments, we made sure that the specific activity of ^{137}Cs does not change noticeably. The real situation is more complicated [3] but this is a topic of a separate report. For us, it is important that the transformation can also take place outside the plasma channel. This is a rather “unpleasant surprise,” because, probably, within several years, when the low-temperature transmutation will be studied in more detail, it would be rather easy to devise a facile and inexpensive process for uranium enrichment. In view of the growth of terrorism all over the world, this outlook seems deplorable

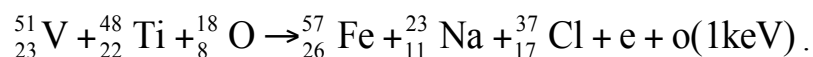
Here is the final remark concerning the experimental study of the transformation. What about gases? The gases are also chemical elements like the other ones. Is it possible that no

gases are formed? Of course, they are formed, and this aspect will be considered in other report [4].

II. Phenomenological model

A direct clue comes from the proportionality between the ^{48}Ti isotope shift and the percentage of foreign chemical elements observed in the experiment. Thus, the material balance equation is required. We were able to compose the balance equations for the binding energy and baryon, electric, and lepton charges [5, 6].

The first step toward the computer simulation of the low-temperature transformations was made by our colleague Doctor Penkov from Dubna [2]. We are also working along this line. Doctor Fillippov will make a detailed report on this topic [7]. We will only briefly mention the main principles that underlie the phenomenological model. We will proceed from the fact that the transformation does take place but we don't understand how the Coulomb barrier is overcome. We consider the assembly of atoms in the initial state and in the transformed state and require that all conservation laws including the energy and the baryon, electric, and lepton charge conservation laws, are fulfilled. By the way, a similar strategy was used by W. Heisenberg and M. Born in the early construction of quantum mechanics. As was mentioned above, the experiment does not show the presence of radioactivity or neutrons, hence, the transformation does not involve strong interactions. Then let only weak interactions be allowed, that is, β -decay and K-capture and the corresponding processes for positrons β^+ . It follows from the experiment that no substantial heat evolution is observed during the transformation. This means that we must look for similar binding energies for the initial and final assemblies of atoms. Then we must decide what particular atoms are to be included in the initial assembly. It is clear that this would be the atoms of the chemical elements that occur in the explosion chamber, in particular, oxygen, titanium and hydrogen. It only remains now to put a question to the Mendeleev Table and to authorize a computer to carry on a long dialog with the Mendeleev Table. Doctor Fillipov managed to teach a computer to do this. He will describe his experience in detail [7]. We will cite only one example



Now, when the answer has been found, the problem looks simple and can be verified using a reference book on the nuclear binding energies. A surprising fact is that with a nuclear binding energy of about 10 meV per nucleon, it is possible to select combinations of atoms that ensure that the total binding energies in the left and right parts of the equation coincide to within approximately $\Delta 100$ eV. An even more surprising fact is that these combinations coincide qualitatively with the experimental results. For example the model including titanium, oxygen and hydrogen does not give any combinations with elements higher than zinc. This is in line with the results presented in Fig. 2. Moreover, the model predicts that the addition of vanadium should yield the ^{57}Fe isotope. This result was actually obtained in experiments.

We drew the following conclusions from the numerical experiment:

1. Contrary to the opinion of the majority of physicists, the possibility of low-energy transformation does not contradict the conservation laws.
2. This process is collective in principle and can be simulated within the framework of processes based on weak interactions.
3. Since weak interactions are characterized by small cross-sections, a catalyst is needed.

III. Monopole as a catalyst?

Experimental searches for the monopole started immediately after the transformation phenomenon had been found. In first experiments tightness of the explosion chamber was insufficient and the unit did not include a prechamber. Because of that plasma was breaking through the sealing, and a plasma glow appeared above the unit [1]. The representative photos made using electron-optical image converters (with an exposure time of the order of 10^{-4} s) are shown in Figure 6. The time delay between the frames equals 10^{-3} s. The second image is yielded by a mirror mounted above the unit. The lifetime of such a structure was $5 \cdot 10^{-3}$ s, that is, it was 50 times longer than the electric pulse duration. This phenomenon is very interesting but it is not the subject of the present report. It should be stressed that radiation traces were registered by nuclear emulsions located at some distance (up to two meters) from the plasma structure.

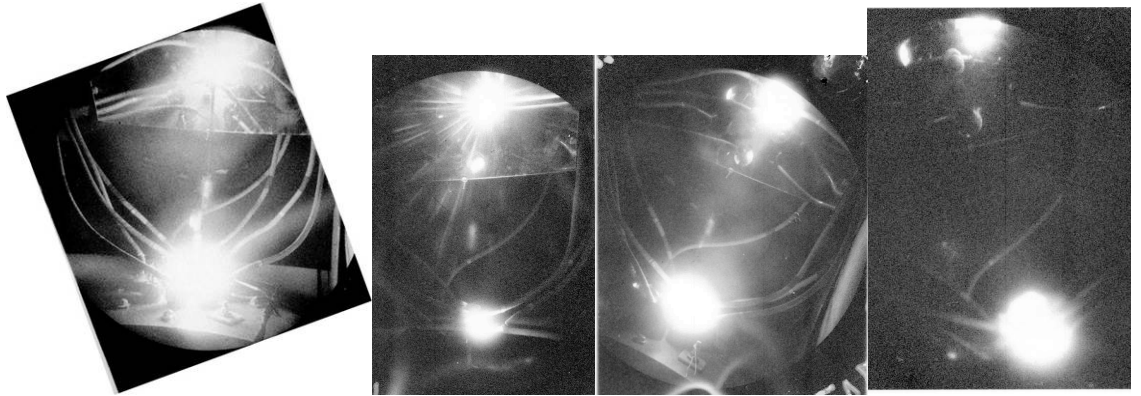


Fig 6.

Typical traces are shown in Figure 7. The blackening density scale is shown in the figure. The traces are very unusual, and because of that the hypothetical radiation was called a ‘strange’ one. In Figure 8, a typical track created by an ion in a nuclear emulsion is shown for comparison. One can readily see that the traces we have found are much broader. Moreover, they are not continuous; frequently are followed by narrower traces, and traces of δ -electrons cannot be seen at all. Such traces (hairs) are always observed when high-energy particles are absorbed. This phenomenon has one more specific feature. Let \vec{n} denote a vector perpendicular to the emulsion plane and \vec{R}_0 a radius-vector originating at the center of the unit. The traces are observed even in the configuration where \vec{n} and \vec{R}_0 are collinear. We have experimentally found that the larger is the distance between the detector and the unit center, the narrower is the trace pattern. At a distance equal to about half meter, the track width is about $30 \mu\text{m}$, while at a 2-meter distance it is only around $5 \mu\text{m}$.

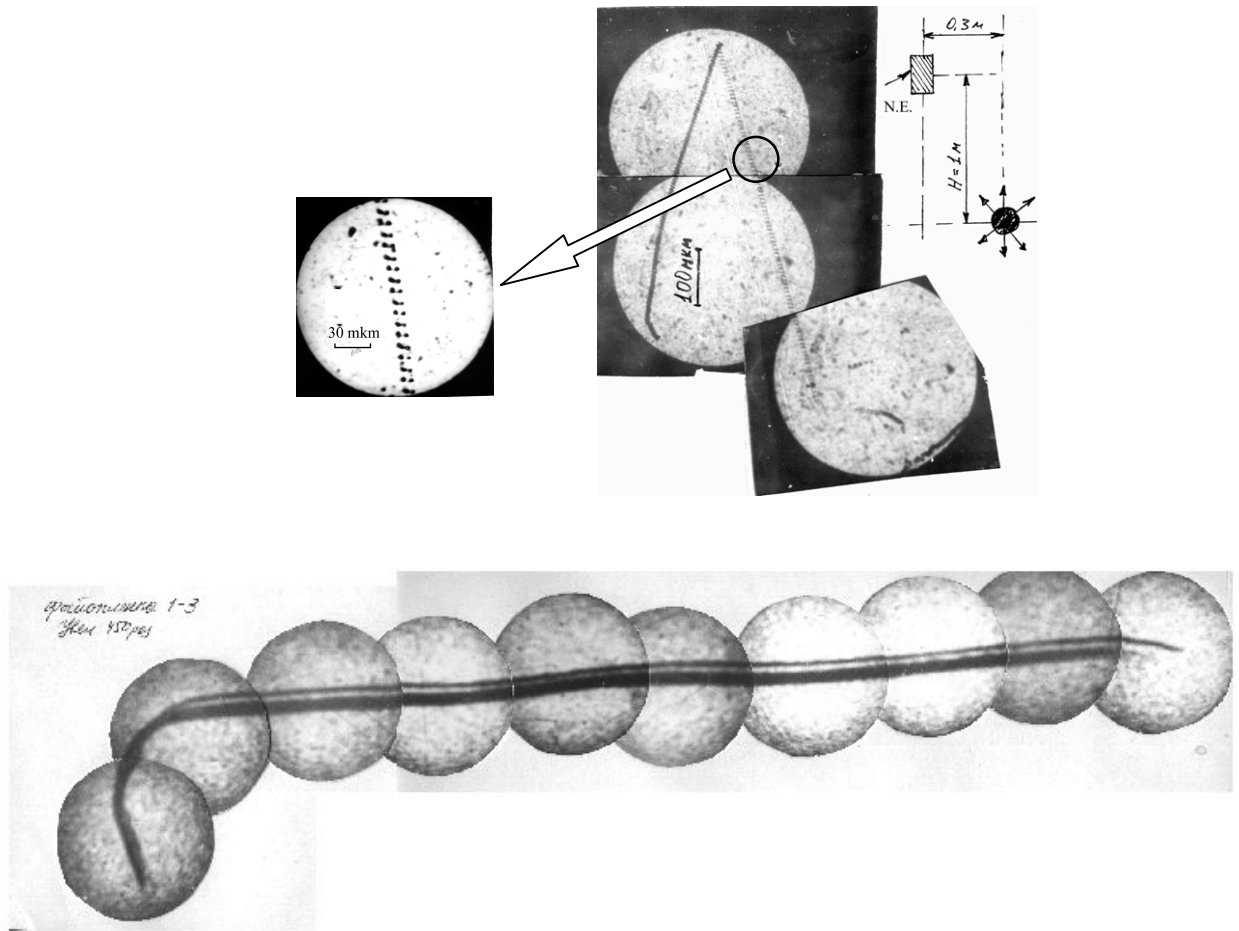


Fig. 7

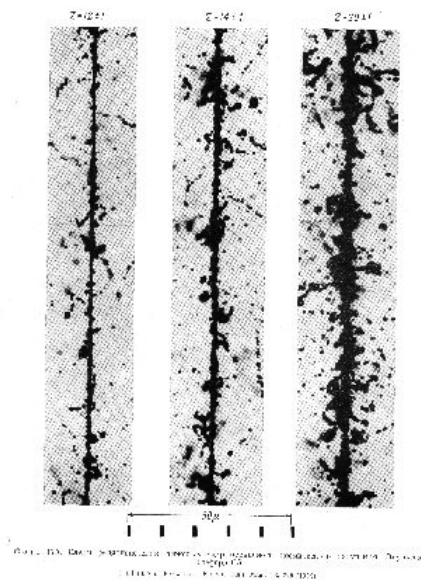


Fig. 8.

To make sure that the traces are not related to some electromagnetic artifacts we installed detectors near the foil remnants only *after* the explosion. During 24 hours we were

registering the traces which were indistinguishable from those, observed at the electric pulse instant.

Thus, we have confirmed the nuclear origin of the radiation being registered. It should be noted that when the unit was subjected to a magnetic field [1], the traces in the nuclear emulsion changed. This is seen in the Figure 9.

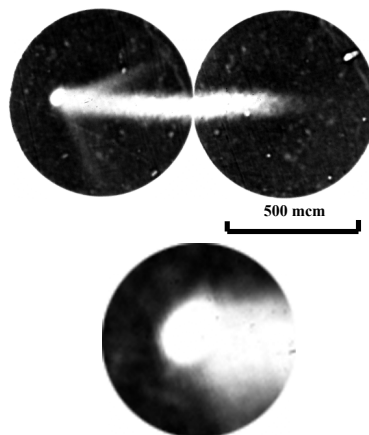


Fig 9.

Doctor Ivoilov will present in his report some very interesting results for the traces [8]. And now we will make some conclusions based on the presented experimental data.

1. The particle which left the trace in the nuclear emulsion is charged, as nuclear emulsions are insensitive to neutrons.
2. The particle cannot have electric charge, as otherwise it could not be able to pass through two meters of atmospheric air and two layers of black paper.
3. The particle does not have high energy, as no delta-electrons are observed.
4. The mechanism of the interaction between the particle and the photosensitive layer is not clear. Assuming the Coulomb mechanism, the absorbed energy estimated using the darkening area equals around 1 GeV.
5. The radiation is of nuclear origin; it interacts with magnetic fields.

Thus I have come to the place in my report where I have to tell about Lochak's magnetic monopole. Unfortunately, Lochak failed to attend the conference. Because of that we do not have the opportunity to learn Lochak's theory presented by the author himself. Georges Lochak asked Urutskoev to expose his theory. We feel sorry but you will have to hear what should be called the magnetic monopole theory as seen by an experimentalist and, moreover, presented in poor English.

Lochak created his theory 20 years before our experiments, that is, before those results for understanding and explaining of which we are now attempting to use it. It should be emphasized that this is a good omen for a theory. It is always suspicious when the theories are created specially to explain an experimental observation. They are like the circles drawn on a target after a shoot has been made.

Dirac's magnetic monopole theory is well known in physics [10]. In his theory Dirac with a mathematic ingenuity specific to him managed to relate non-integrability of the wave function's phase to the singularity which emerges when describing the interaction between the electron and the magnetic pole. Paradoxically, the Dirac monopole is not described by the fundamental equation of the quantum electrodynamics which is named after him. This seems

to be the reason why the Dirac monopole is not in the mainstream of the development of theoretical physics. There is one more reason for that which is related to symmetry. Writing the equation for the Lorentz force acting on a magnetic charge:

$$\vec{F}_L = g \cdot \left(\vec{H} - \frac{1}{c} \cdot \vec{v} \times \vec{E} \right)$$

we can see easily that inasmuch as \vec{F} is a polar vector and the right-hand side of the equation is a pseudo-vector, then g , the magnetic charge, is to be a pseudo-scalar. This fact is very unusual for physicists. It means that the magnetic charge features a symmetry type other than the electric charge. Pierre Curie was the first to notice this fact. His way of reasoning is very simple and at the same time very wise. The electric charge is a scalar and it generates a field described by a polar vector E . Inasmuch as the magnetic field vector H is a pseudo-vector, the source which generates this field (that is, the magnetic charge) should have the same symmetry, implying that the magnetic charge is a pseudo-scalar. Based on this Lochak argues: "There is no real symmetry between electricity and magnetism but there are two slopes of the same pinnacle: a vector slope and a pseudo-vector one."

In mathematical terms, the Dirac equation is invariant to two and only two gauge transformations. Indeed, the Dirac equation for a relativistic charged particle with spin $S=1/2$ in an external field can be written in the following form

$$\left(\gamma_\mu \nabla_\mu + \frac{mc}{\hbar} \right) \psi = 0 \quad (1)$$

where γ_μ are 4×4 Dirac matrices, and ψ is a bi-spinor.

Then, if we subject the bi-spinor to the following transformation

$$\psi \rightarrow \psi' = \exp\left(i \frac{e}{\hbar c} \cdot \mathbf{I} \cdot \varphi \right) \cdot \psi$$

where \mathbf{I} is the unit matrix and the operators have the following form

$$\begin{aligned} \nabla_\mu &= \partial_\mu - i \frac{e}{\hbar c} \cdot \mathbf{I} \cdot A_\mu, \\ A_\mu &\rightarrow A_\mu + \partial_\mu \varphi, \end{aligned}$$

then Equation (1) transforms into the well-known equation for the electron:

$$\gamma_\mu \left(\partial_\mu - i \frac{e}{\hbar c} A_\mu \right) \psi + \frac{mc}{\hbar} \psi = 0. \quad (2)$$

Now, if we use Dirac equation (1) without the mass term, that is, actually the equation describing the neutrino

$$\gamma_{\mu} \nabla_{\mu} \Psi = 0, \quad (3)$$

and represent the gauge invariance using a pseudo-scalar matrix

$$\gamma_5 = \gamma_1 \cdot \gamma_2 \cdot \gamma_3 \cdot \gamma_4 = \begin{pmatrix} 0 & \mathbf{I} \\ \mathbf{I} & 0 \end{pmatrix},$$

where \mathbf{I} is the 2×2 unit matrix, and transform the bi-spinor as follows

$$\Psi \rightarrow \Psi' = \exp\left(i \frac{\mathbf{g}}{\hbar c} \cdot \gamma_5 \cdot \chi\right) \cdot \Psi,$$

then the operator will have the form

$$\nabla_{\mu} = \partial_{\mu} - \frac{\mathbf{g}}{\hbar c} \gamma_5 \mathbf{B}_{\mu},$$

and the local gauge will have the following form

$$\mathbf{B}_{\mu} \rightarrow \mathbf{B}_{\mu} + i \cdot \partial_{\mu} \chi.$$

Note that because of the pseudo-scalar matrix γ_5 the field \mathbf{B} is a pseudo-potential and χ is a pseudo-phase. However, the pseudo-scalar feature of magnetism is expressed using the charge operator $G = \mathbf{g} \cdot \gamma_5$ where \mathbf{g} is a usual scalar. The Lochak equation for the magnetic charge has the form

$$\gamma_{\mu} \left(\partial_{\mu} - \frac{\mathbf{g}}{\hbar c} \gamma_5 \mathbf{B}_{\mu} \right) \Psi = 0. \quad (4)$$

The phase gauge using γ_5 was known before Lochak's works, but it was him who managed to find the physical sense in Equation (4): it is the equation describing the magnetic monopole with zero mass. Thus, in Lochak's theory the magnetic monopole is a kind of the magnetically excited neutrino. Do not forget that it is described by the same equation as the neutrino. No doubt, Lochak's theory is not completed yet and needs further development. As for its application for solving the exact physical problems and its integration in Standard Model also. Professor Harald Stumpf works actively in this direction for several years [13, 15].

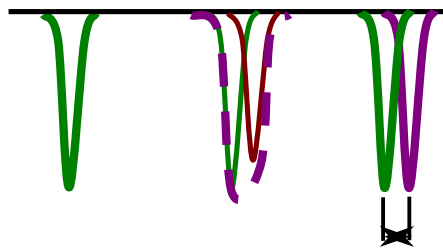
One can ask why Lochak's theory, if it is correct, has not interested anyone for twenty years? The answer to this question is obvious. French physicists are deeply convinced that all genuine physical theories can only be developed outside France. Other physicists usually do not read scientific publications in French. Because of that Lochak's works are not known to academics.

A more profound reason is that the Standard Model does not need the leptonic magnetic monopole. Today's physics is reigned by the dictatorship of democracy. Let's explain that using a simple example. About five years ago a CERN paper was published which had around 600 authors. The list of authors was longer than the article itself. As to the authors

of the present report, we believe that an idea may come to one head or maximum to two heads but in no way to 600 heads at the same time. Having in mind that theorists and experimentalists tend to consider the Standard Model impeccable (something like a holy icon), you will understand the attitude to Lochak's theory. After this brief digression we should return to the main subject of the report and to make some conclusions which are so much needed to an experimentalist.

Thus, according to Lochak, the magnetic monopole is a fermion. Moreover it features chiral symmetry [13]; it means that under a spatial reflection the charge seems to change its sign. In reality the charge operator G passes from one of its own meanings (for example corresponding the left monopole) to another one (right monopole) [14]. This is very unusual for experimentalists who are accustomed to deal with electric charges which do not allow themselves such a behavior. According to the classification adopted in the elementary particle physics, the monopole is a lepton and, hence, it participates in weak interactions. Because its rest mass is zero, not much energy is needed to create a monopole-antimonopole pair. On the other hand, it is for this reason that its registration is not an easy task. Naturally one can ask: if everything is so easy, why the monopole has not been detected earlier? We believe that first it is necessary to find the monopole, to make sure it exists and only after that, it will be possible to answer this question.

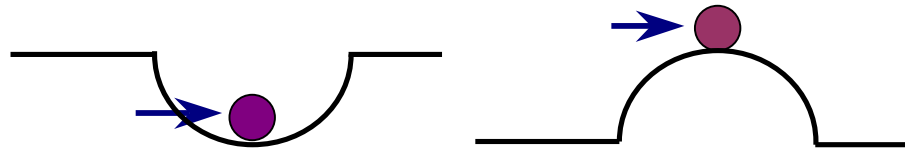
Our experimental search for the monopole started with an attempt to capture it in a ferromagnetic trap. Foil made of ^{57}Fe was used as such a trap. The idea was that capture of the monopole by the ferromagnetic will change the field on the ^{57}Fe nucleus. This in turn will affect the width of Mössbauer spectrum lines. Let (a) be the line width before irradiation. We would expect to see (b), and have instead observed (c). This means that the Mössbauer spectrum of ^{57}Fe (containing 6 lines) has not broadened but has only shifted by the same value equal to $\Delta H = 500 \pm 70$ Gs. This means that we observe some collective effect. Doctor Ivoilov will discuss this subject in detail in his report [16, 9].



Another feature of the magnetic monopole, which follows from Lochak's theory, is that it has a leptonic origin. Because of this, one can hope that the presence of the magnetic monopole affects the β -decay. Based on this, in the experiments with uranium salts we measured very accurately the β -decay periods of daughter isotopes in the uranium and thorium series. In the experiment, we have found that thorium secular equilibrium and, hence, the probability of the β -decay of the protactinium isomer is strongly changed. Prof. Rukhadze will tell about our observations in his report [17, 18].

The Lochak magnetic 'neutrino' has zero rest mass and, hence, it cannot exert any energetic effects on an atomic system. However, if a system rich in energy is in a non-equilibrium state and the chain reaction can develop in it, the situation changes. This is shown in the figure. In case (a) a small perturbation will only result in small oscillations. Smart

- a** theorists will persuade you that this is due to zero oscillations of vacuum. It is obvious that in
- b** case (b) the result will be quite different. A nuclear reactor is a good example of such system. Henri Rukhadze will tell you in detail how catastrophic will be the consequences of even insignificant changes in the β -decay periods of nuclei [18].



Ammonium nitrate is another example of a system rich in energy [19]. Henri Lehn, our French colleague, will tell you about results of our joint experiments (held in our experimental unit), in which we observed interaction between magnetic charges and ammonium nitrate.

For understandable reasons the issues related to the interaction between the magnetic radiation and biological objects are of no small importance for us as a human is, to large extent, an electromagnetic system. Chelyabinsk biophysicists conducted some pilot experiments, in which laboratory animals were irradiated in our experimental unit. Doctor Pryakhin will tell you about the results of these experiments [20]. I will only mention that we have observed that the number of stem cells in the animals' marrow changes.

Conclusions

1. Thus, to summarize, one can assume that we seem to have found a new type of interaction. It has magnetic nature and catalyzes nuclear processes by initiating weak interactions. In the opinion of the authors of this report, a new type of activity has been found (g- or m-activity). It should be stressed that last statements are nothing but hypotheses though, in our opinion, they are not unsubstantiated. I'd like to state in Lochak's name and in mine that should the aforementioned hypothesis prove to be wrong, we will bear scientific responsibility. If the result is positive, it will undoubtedly be an achievement of the entire French and Russian team. Even if the statements are not wrong, a lot of efforts will be needed to check their correctness.

The results presented in this talk were obtained by a large team of specialists and technical staff. It is my pleasure to list the team members:

“RECOM” specialists:

Dr. Dmitry Filippov, Dr. Vladimir Liksonov, Dr. Valery Kuznetsov, Dp.Ing. Alexander Govorun, Dp.Ing. Anatoly Volkovich, Dp.Ing. Sergei Smirnov, Dp.Ing. Victor Korolev, Dp.Ing. Alexander Guliaev, Dp.Ing. Chermen Kaitukov, Dp.Ing. Victor Kalensky, Dp.Ing. Sergei Petrushko.

“RECOM” technical staff:

Vladimir Shevchenko, Pavel Strashko, Dp.Ing. Tatiana Sokolova, Nikolai Zubkov, Alexander Gaverdovsky, Vladimir Bajushkin, Evgeny Sergeev, Vladimir Petrushko.

National Research Center “Kurchatov Institute”:

Pr.ph. Vladlen Tsinoev, Dp.In. Sergei Zukov, Dr. Rosa Rjabova, Dr. Jury Dontsov, Dp.Ing. Boris Novoselov, Dr. Leonid Elesin, Dp.Ing Vladimir Dorovskoi, Dr. Sviatoslav Demkin, Dp.Ing. Vladimir Stolyarov.

Institute of Inorganic Chemistry:

Dr. Alexander Steblevsky.

Central Research Institute for Chemical Machine Building:

Dr. Pavel Stolyarov.

Institute of General Physics:

Professor Anri Rukhadze.

Kazan State University:

Dr. Nikolai Ivoilov.

Chelyabinsk State University:

Dr. Evgeny Pryakhin.

Institute of Chemical Physics:

Dr. Vladimir Fedotov.

Many observations have not been included in this report. However, it has already continued for a long time. Thank you.

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