

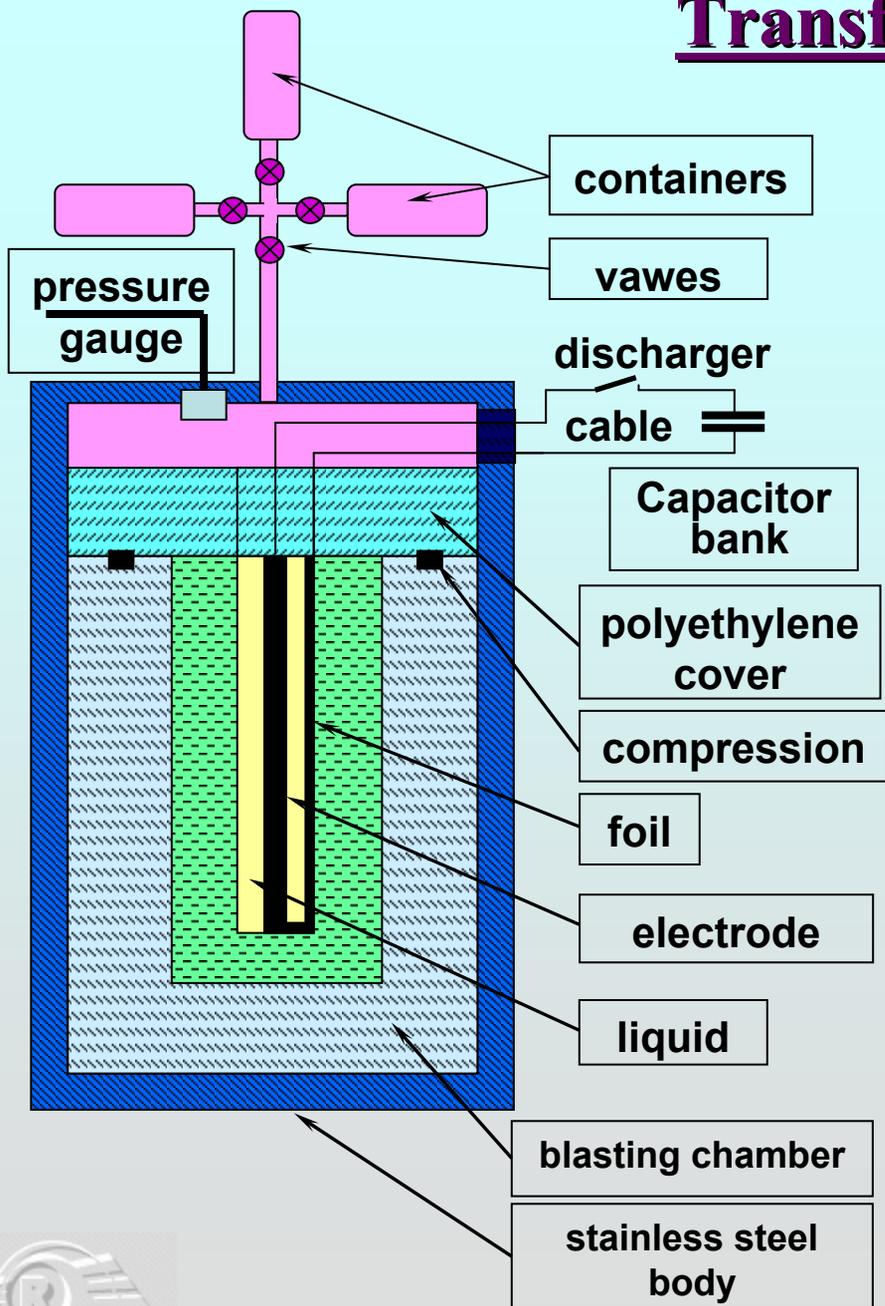
Low-energy nuclear reactions and the Lochak monopole

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Transformation

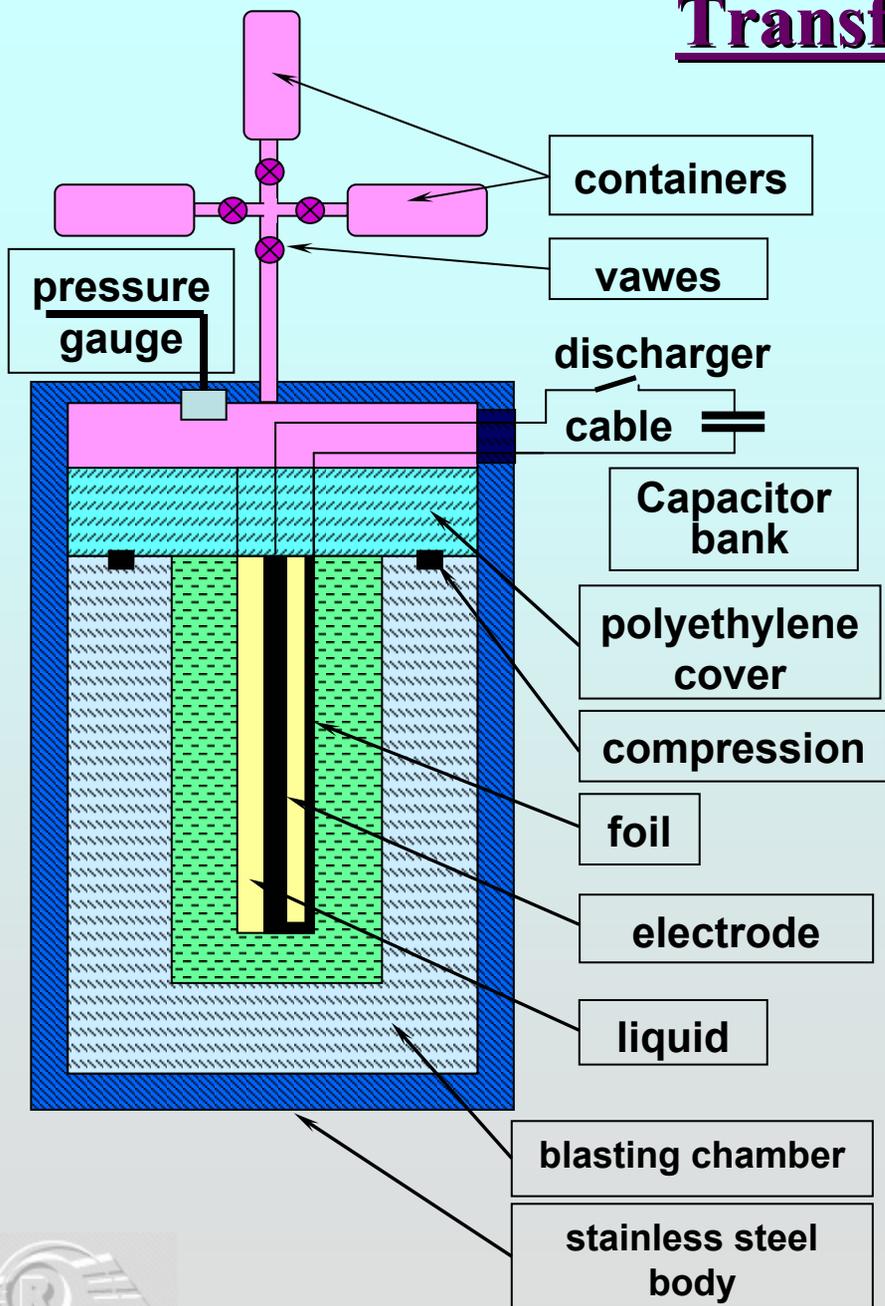


We are attending your Conference for the first time. Hence, I'll outline briefly all the results to give the overall picture of our research. My report surveys the experimental and theoretical studies carried out at the RECOM since 1998 and the theoretical studies of Georges Lochak (Louis de Broglie Foundation).

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 Figure.



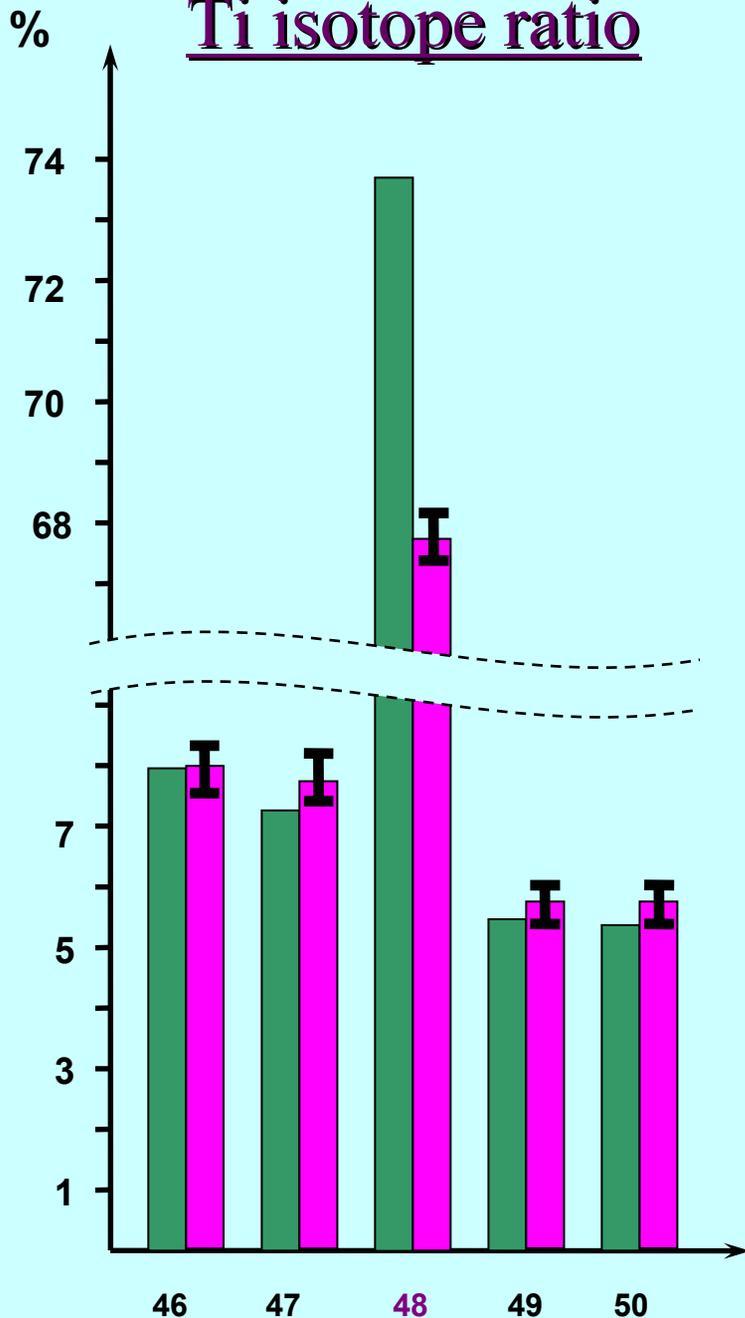
Transformation



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.

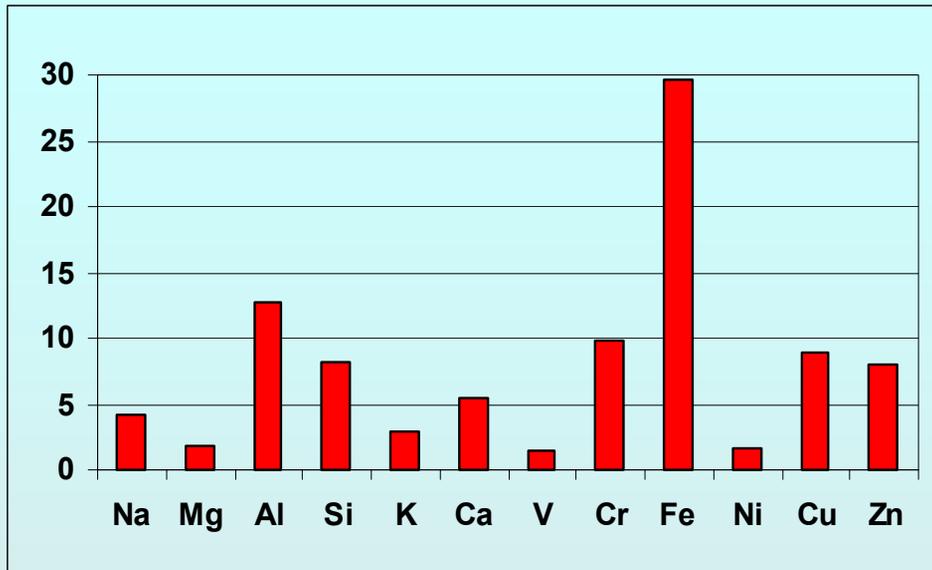


Ti isotope ratio



The key result is as follows. The remainder of the titanium foil shows a distorted titanium isotope ratio. The **natural** isotope ratio is shown in green. It can be seen from the Figure that the situation looks as if **Ti⁴⁸ “disappeared”** at the instance of the pulse. Please, pay attention that the Ti⁴⁸ 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 Ti⁴⁸ in some experiments is **~5%** while the error of measurements is **± 0.4%**. Simultaneously with disappearance of Ti⁴⁸, 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 Ti⁴⁸.

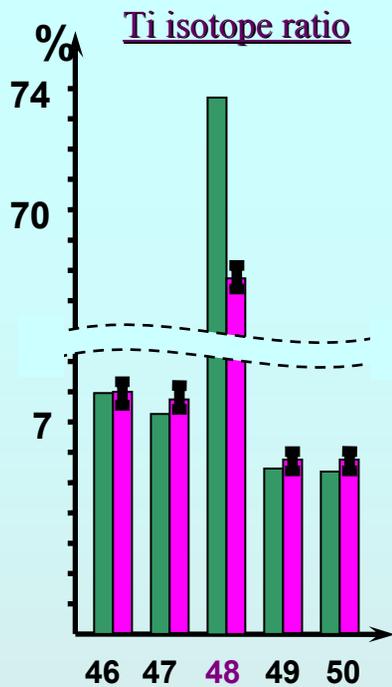
The chemical composition



The chemical composition of the resulting foreign components is shown in Fig. All the components that could be present from the beginning have been subtracted.

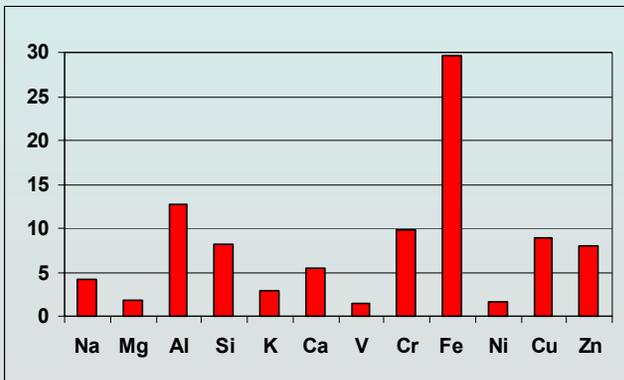
I am not going to analyze the experimental results, as this analysis has been published in English in [Annales de la Fondation Louis de Broglie, Vol. 27 # 4, 2002](#). Nevertheless, the results were so unexpected that they called for an independent verification. This was done by our colleagues from Dubna (Kuznetsov's group). The verification was thorough, and the results were published in [Annales de la Fondation Louis de Broglie, Vol. 28 # 2, 2003](#). 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 $I < 10^3$ per pulse. This is a weighty reason supporting the assumption that our "magical" nuclear transformations do not involve strong interactions.

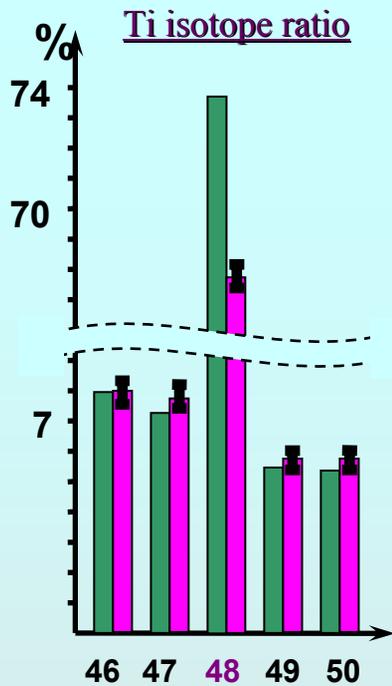




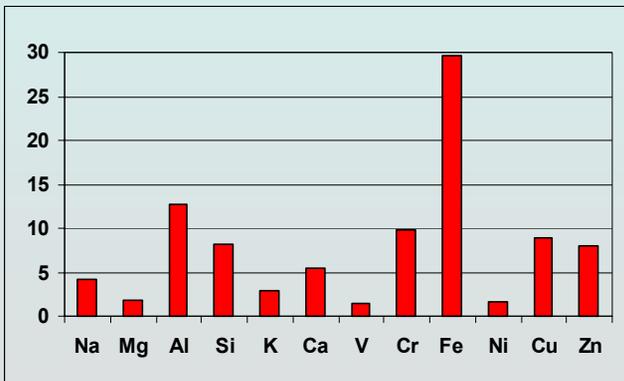
Important also is one more fact found both in our experiments and in Kuznetsov's group experiments. **Neither of us observed any significant residual γ -activity in the samples.** The lack of excited nuclei is important because this allows one to reject all hypothetical accelerative mechanisms for the 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 titanium 48 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 I have already noted, they got the same result – a loss of titanium 48. Thus, a procedural error also can be ruled out.

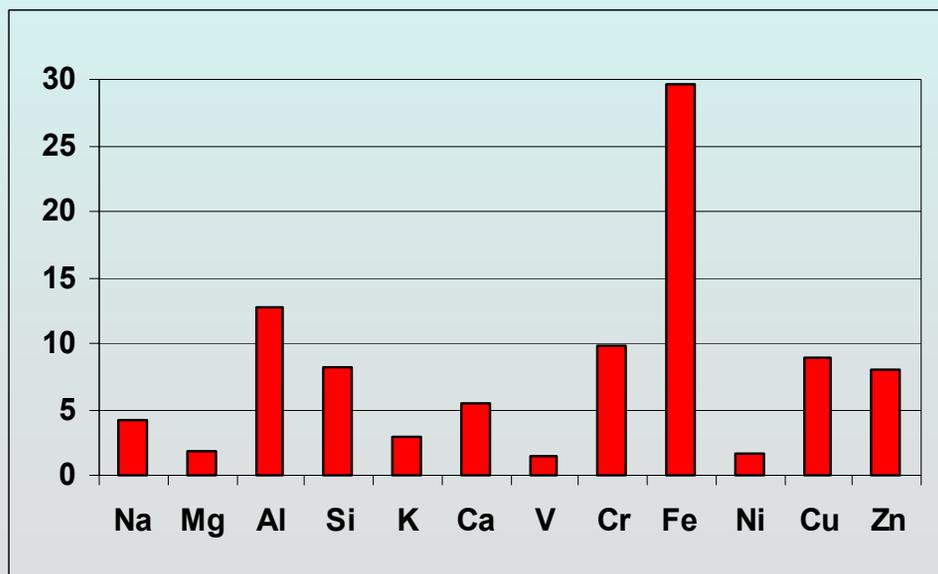




Why do I discuss the isotope shift in so much detail? The reason is that exactly this fact attests to low-energy nuclear reactions. The mere detection of foreign chemical elements in a tightly sealed chamber could be attributed to admixtures of the materials that make up the device. Conversely, **an 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 titanium 48 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 the de Broglie Foundation, 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 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 Figure. 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 semi-quantitative. Another fact is important, namely, one isotope (the parent atom), in particular, titanium 48 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.

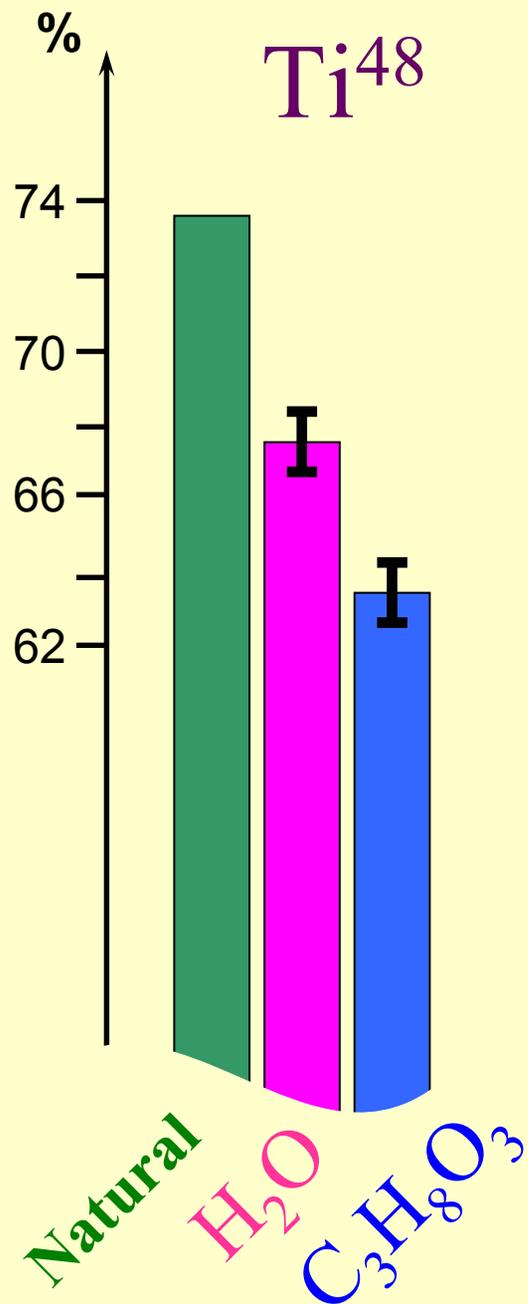


Nevertheless, some words should be said about the procedural legitimacy of the determination of the composition of daughter chemical elements presented in Figure. Apart from mass spectrometry, X-ray fluorescence analysis and optical spectrometry methods were used for this purpose. All the results are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



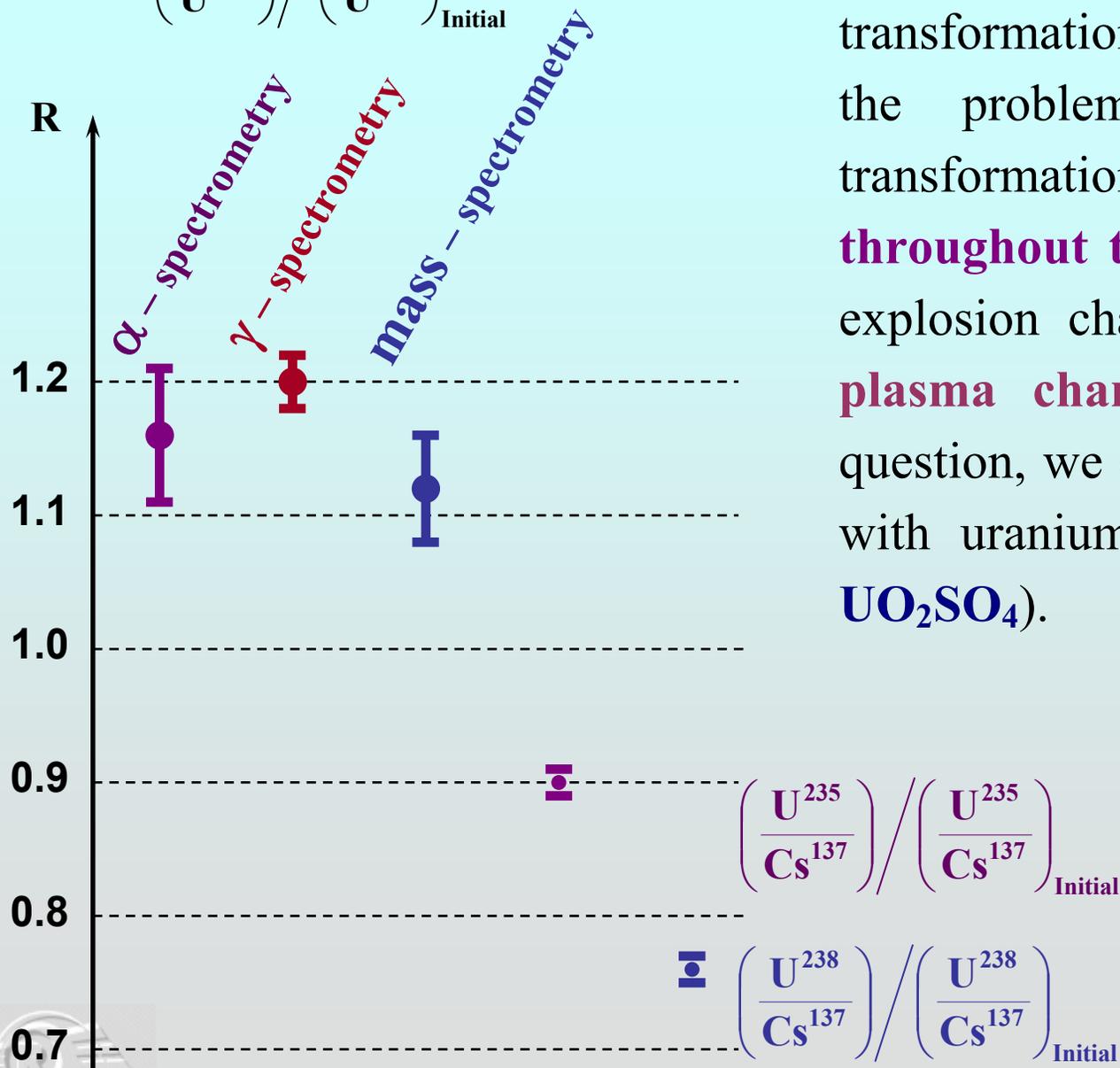
Yet another problem, namely, the reproducibility of experiments is critical for the whole cold nuclear synthesis, and we will consider it here. **The scatter of the electrical parameters** of our setup (the current and the charge) from one experiment to another **is about 15% with the same load**. Having worked for my whole scientific life in the plasma physics, I would like to say 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 do not include these “Olympic records.”





However, despite all my 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 shows the average titanium 48 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, I'll admit that we haven't found the reason as yet.

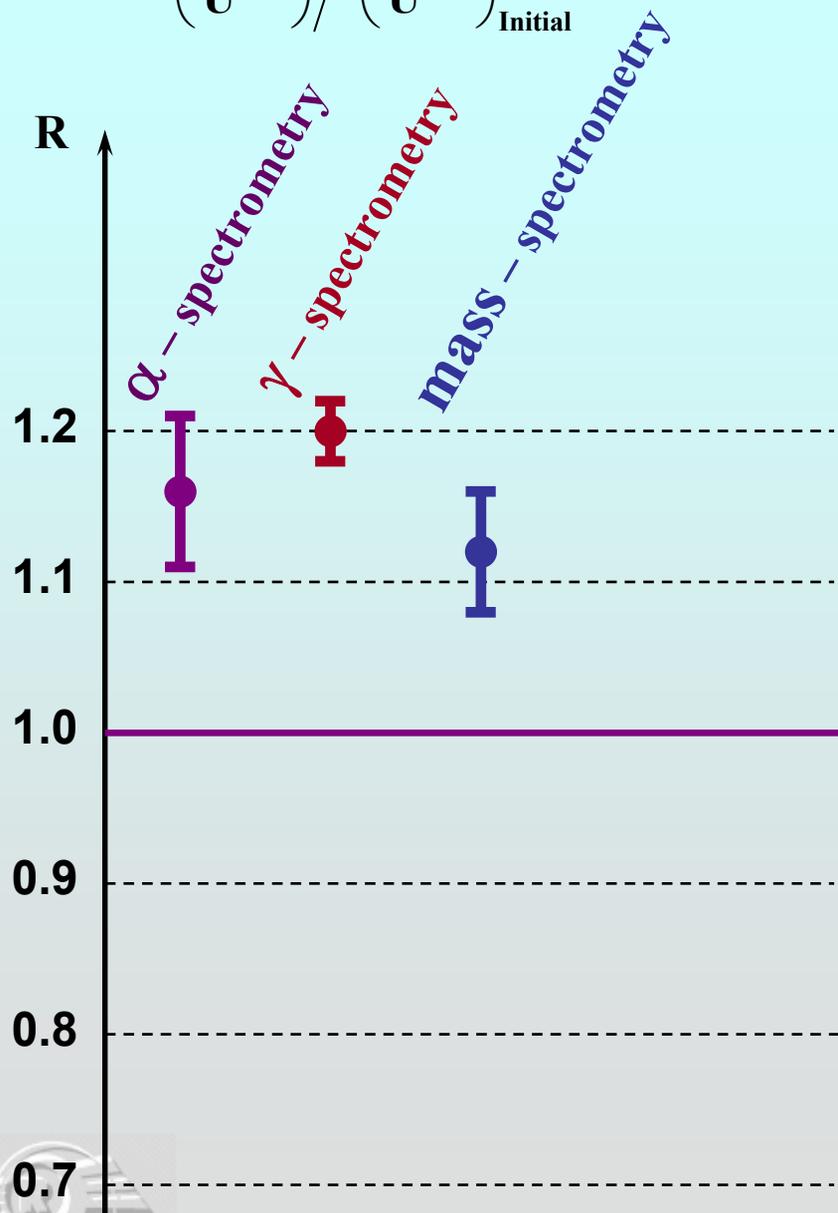
$$R = \left(\frac{U^{235}}{U^{238}} \right) / \left(\frac{U^{235}}{U^{238}} \right)_{\text{Initial}}$$



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).



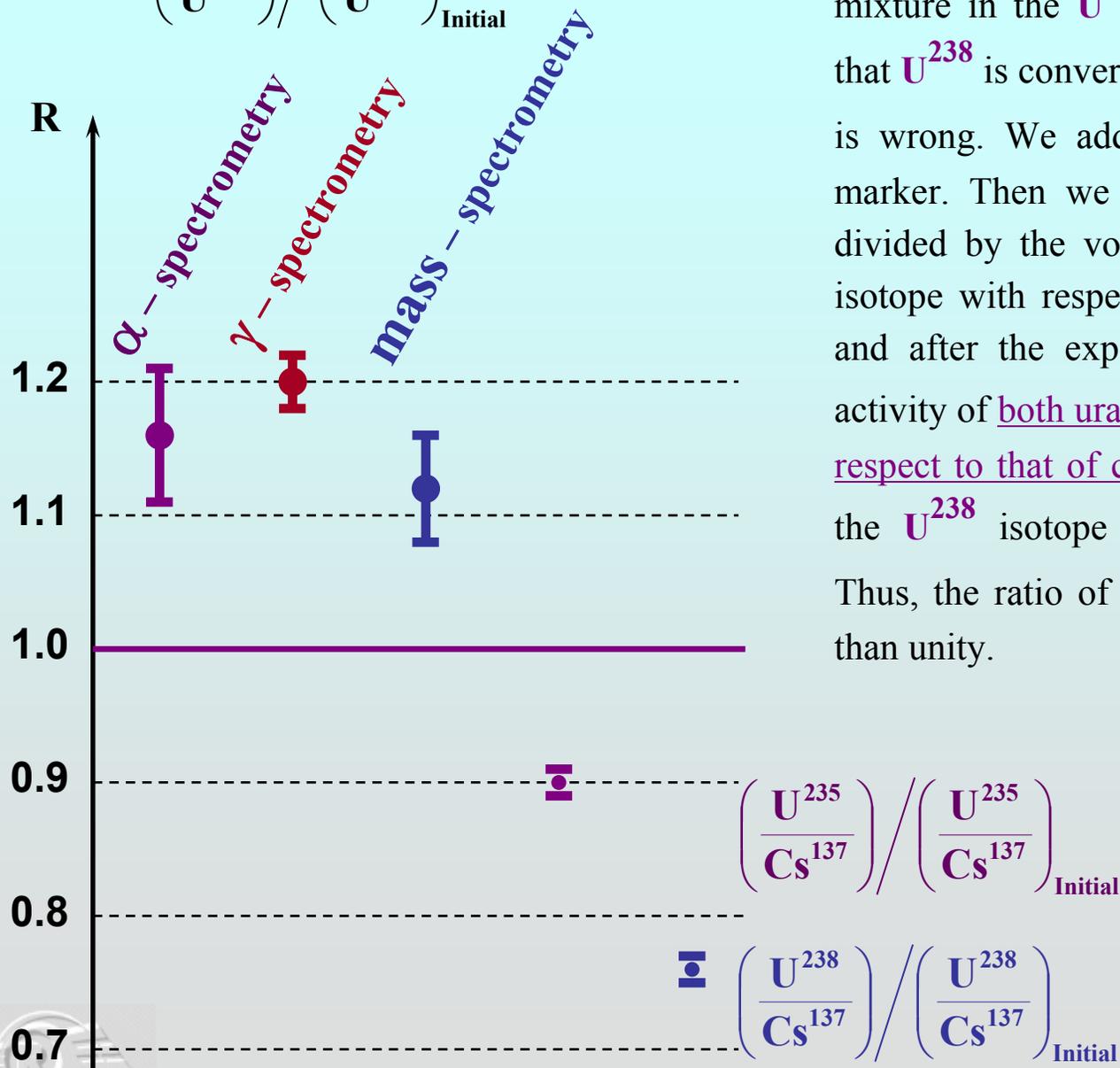
$$R = \left(\frac{U^{235}}{U^{238}} \right) / \left(\frac{U^{235}}{U^{238}} \right)_{\text{Initial}}$$



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 titanium 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 uranium. Uranium has two isotopes, U^{235} and U^{238} , whose ratio can be easily measured even at a low specific concentration by means of γ , β and α -spectrometry. Figure shows the U^{235}/U^{238} 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 U^{235} isotope.



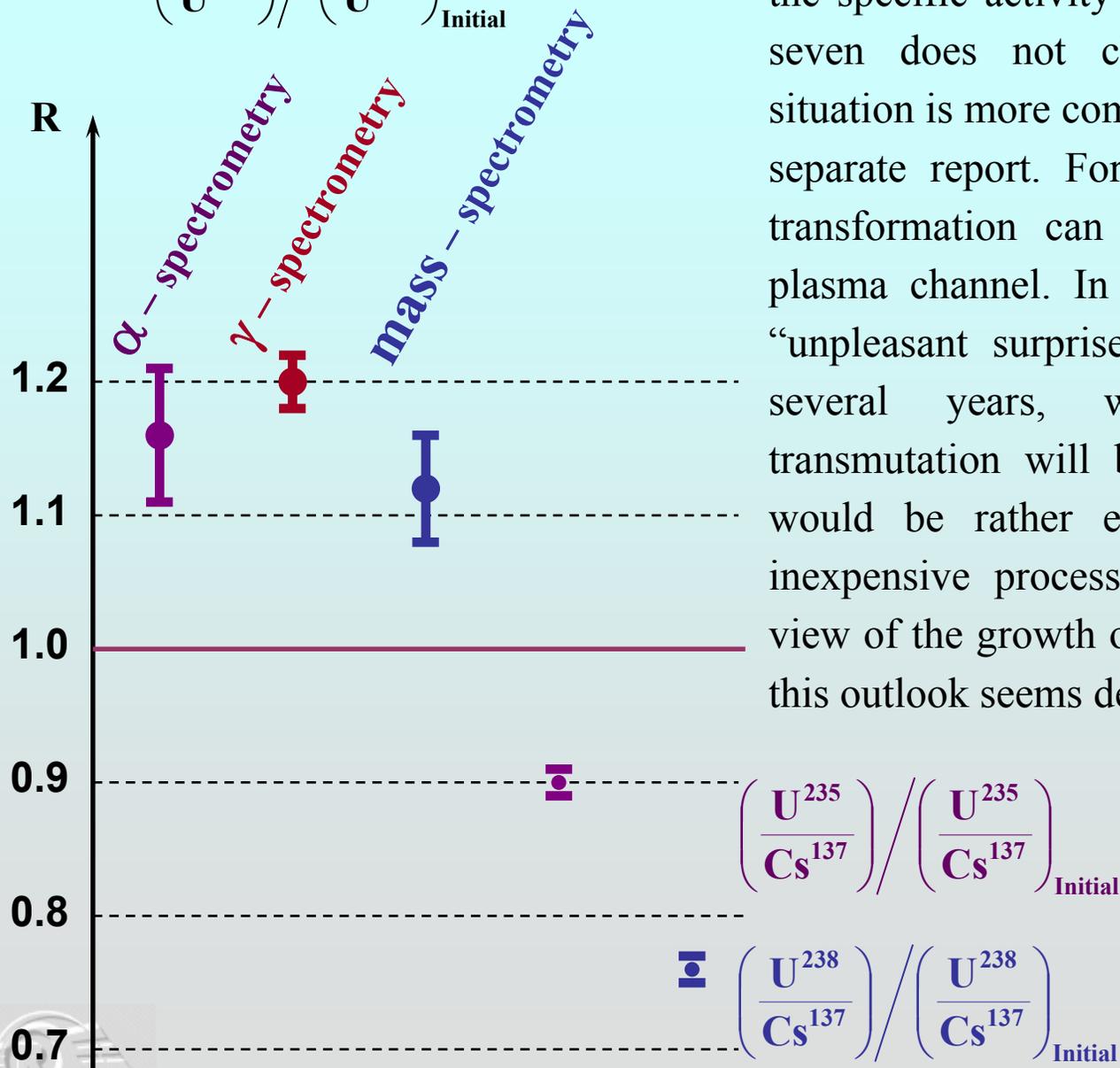
$$R = \left(\frac{U^{235}}{U^{238}} \right) / \left(\frac{U^{235}}{U^{238}} \right)_{\text{Initial}}$$



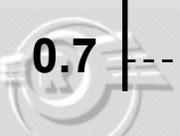
The shift occurs toward **enrichment** of the mixture in the U^{235} isotope. This does not mean that U^{238} is converted into U^{235} . This interpretation is wrong. We added some Cs^{137} isotope as the marker. Then we measured the specific (that is, divided by the volume) activity of each uranium isotope with respect to the cesium activity before and after the experiment. It was found that the activity of both uranium isotopes decreased with respect to that of cesium. However, the activity of the U^{238} isotope decreases to a greater extent. Thus, the ratio of U^{235} to U^{238} becomes **bigger** than unity.



$$R = \left(\frac{U^{235}}{U^{238}} \right) / \left(\frac{U^{235}}{U^{238}} \right)_{\text{Initial}}$$



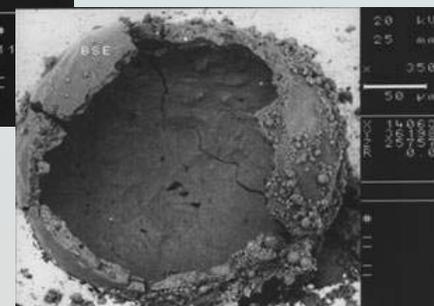
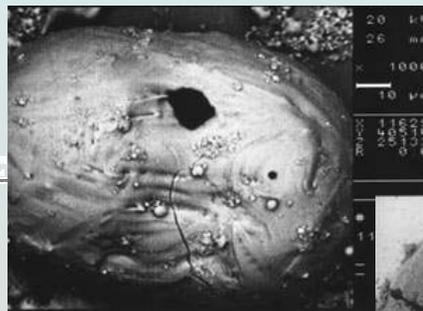
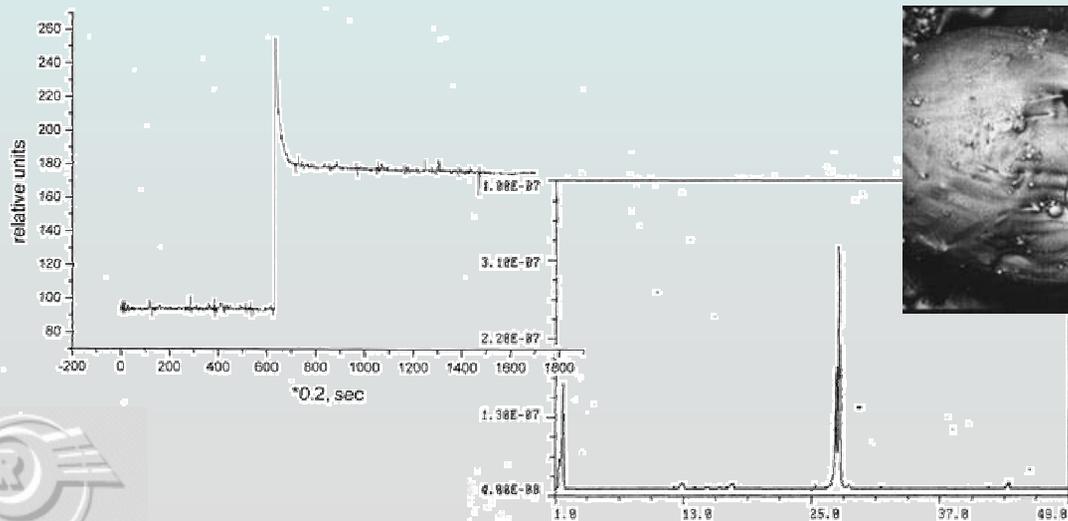
Prior to these experiments, we made sure that the specific activity of cesium one hundred thirty seven does not change noticeably. The real situation is more complicated but this is a topic of a separate report. For us, it is important that the transformation can also take place outside the plasma channel. In our opinion, 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 my other report:

Study of the gas outburst formed upon electric explosion of titanium foils in liquids

L. I. Urutskoev, V. M. Dorovskoi, S. A. Dyomkin, L. A. Elesin, V. G. Fedotov, D. V. Filippov, A. P. Govorun, A. A. Gulyaev, V. L. Kuznetsov, S. V. Petrushko, A. V. Steblevskii, V. L. Stolyarov.



Phenomenological model

A direct clue comes from the proportionality between the Ti^{48} 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.

The first step toward the computer simulation of the low-temperature transformations was made by our colleague **Doctor Pen'kov from Dubna**. We are also working along this line. **Doctor Fillipov** will make a detailed report on this topic. I 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 Born in the early construction of quantum mechanics. As I 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. I will cite only one example



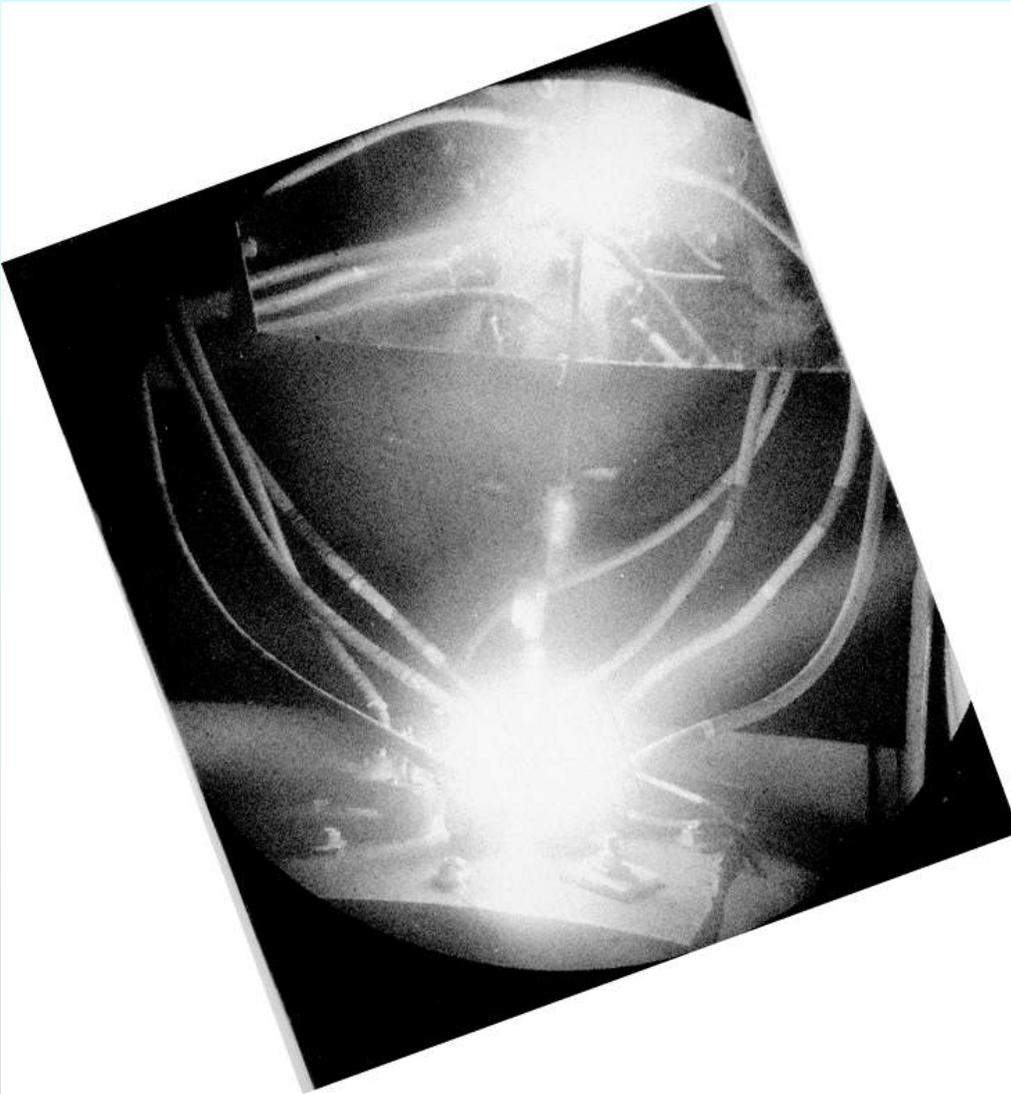
Now, when the answer has been found, the problem looks simple and can be verified using a reference book on the nuclear binding energies. A surprising fact is that with a nuclear binding energy of about **7 MeV** per nucleon and higher, it is possible to select combinations of atoms that ensure that the total binding energies in the left and right parts of the equation coincide to within approximately **$\Delta \sim 100$ 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 I have presented. Moreover, the model predicts that the addition of **vanadium** should yield the **iron 57** 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**.

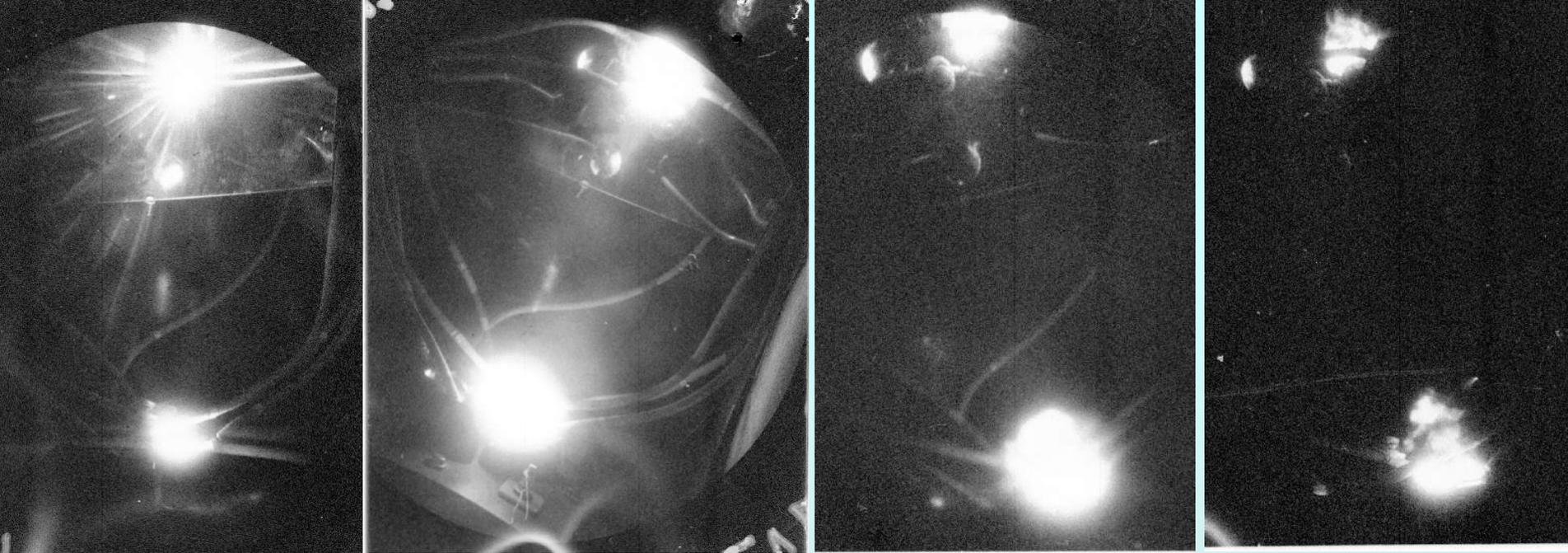


Monopole as a catalyst?



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. The representative photos made using **electron-optical image converters** (with an exposure time of the order of 10^{-4} s) are shown in **Figure**.





1 ms

2 ms

3 ms

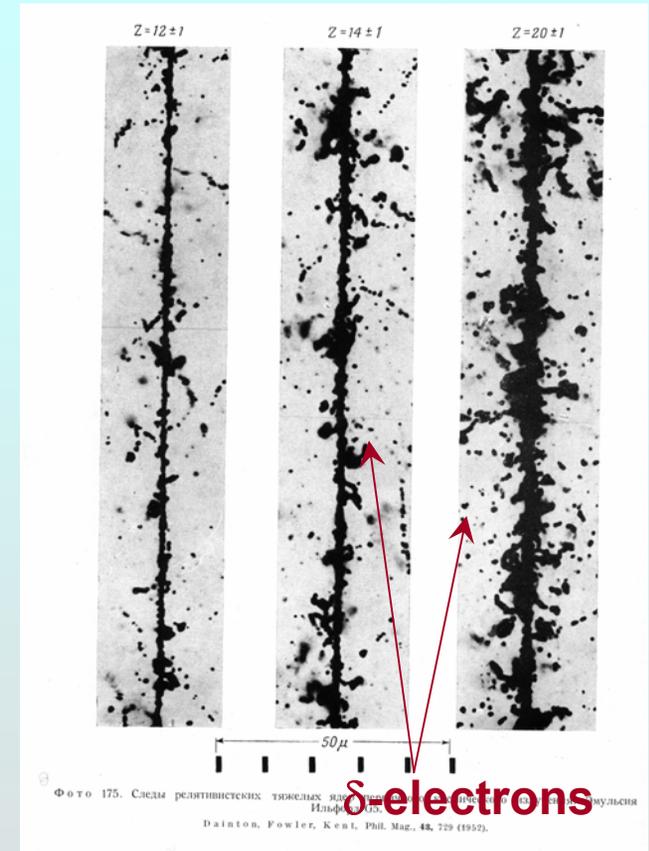
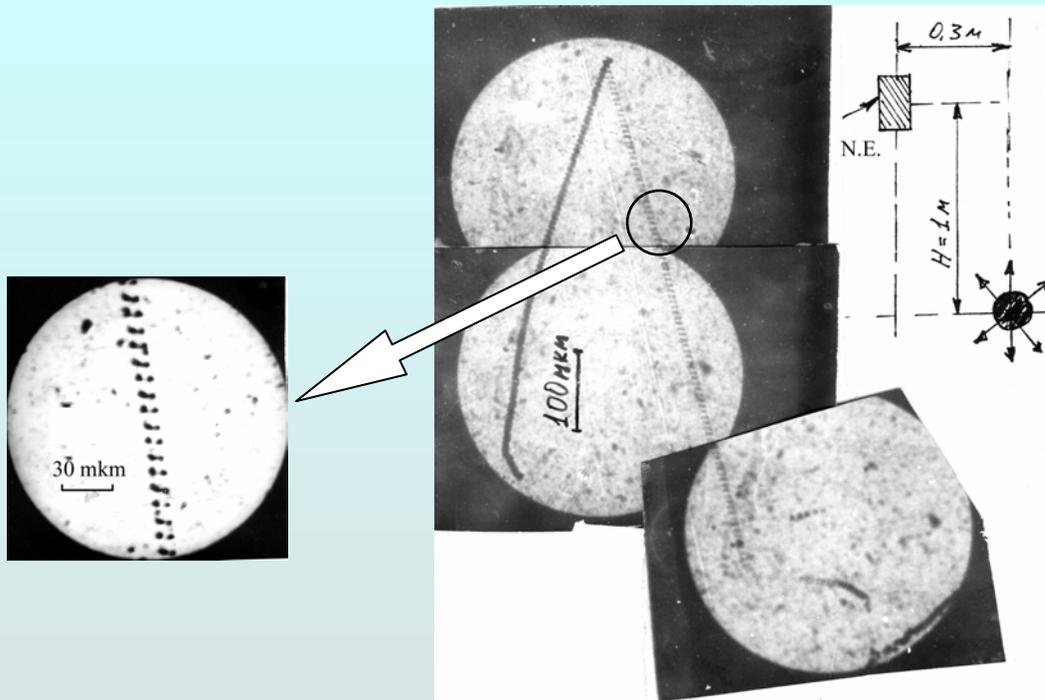
4 ms

Exposure time $\sim 10^{-4}$ s

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 unfortunately I do not have time to tell about it. It should be stressed that radiation traces were registered by nuclear emulsions located at some distance (up to two meters) from the plasma structure.

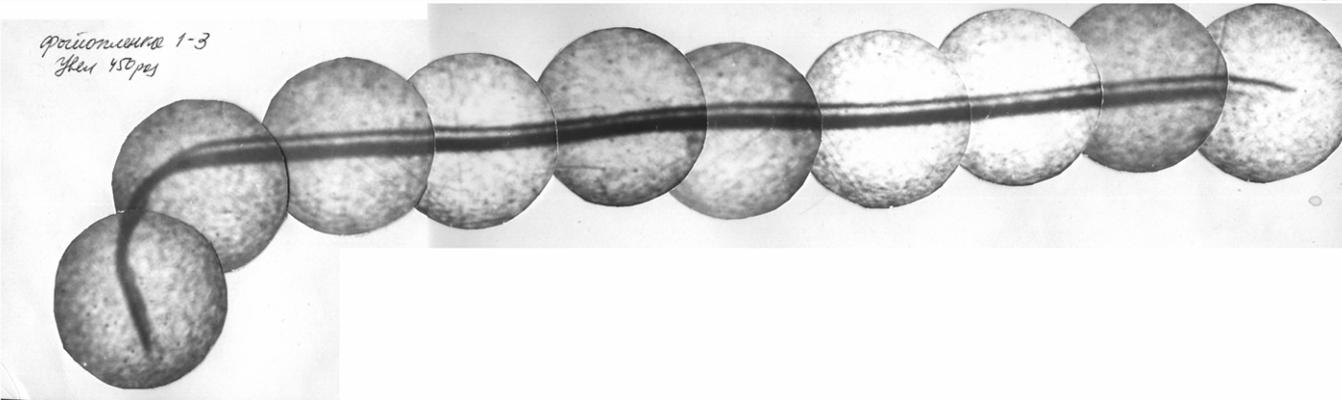
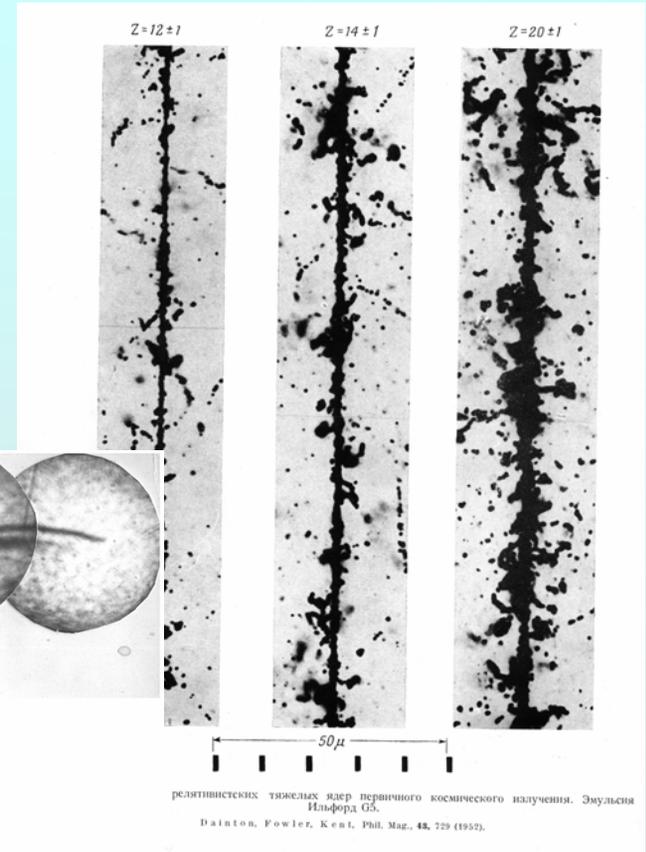
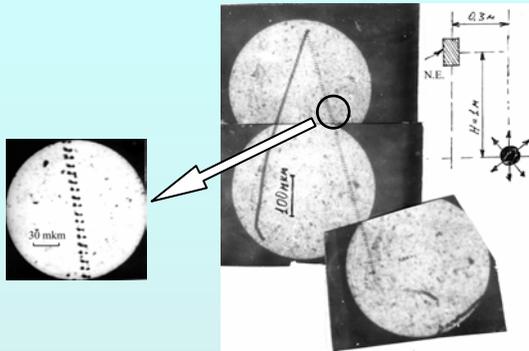


Typical traces are shown in **Figure**. The blackening density scale is shown in the figure. The traces are very unusual, and because of that the hypothetical radiation was called a ‘strange’ one.



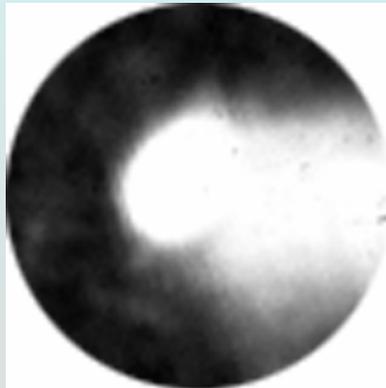
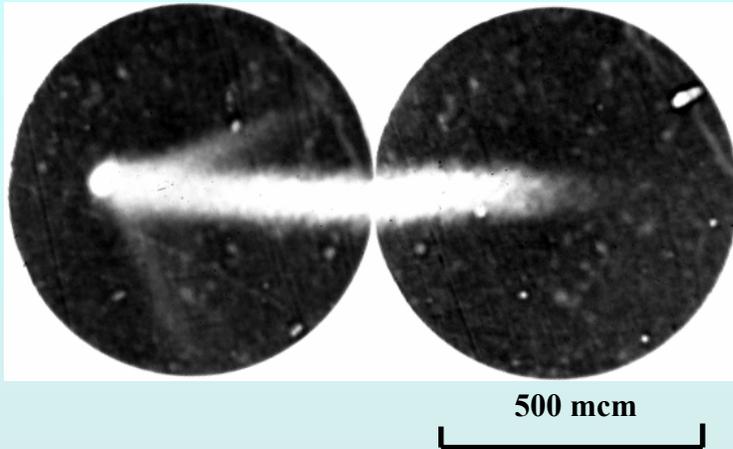
In another **Figure**, a typical track created by an ion in a nuclear emulsion is shown for comparison. One can readily see that the traces we have found are much broader. Moreover, they are not continuous; frequently are narrower, and traces of **δ-electrons** cannot be seen at all. Such traces (hairs) are always observed when high-energy particles are absorbed.

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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 μm** , while at a 2-meter distance it is only around **5 μm** .



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, the traces in the nuclear emulsion changed. This is seen in the **figure**.

Doctor Ivoilov will present in his report some very interesting results for the traces. 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.



Lochak's magnetic monopole

Thus I have come to the place in my report where I have to tell about Lochak's magnetic monopole. 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. I am always suspicious to the theories which 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. 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 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 seems to be the first who have noticed 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 four-dimensional column consisting of two spinors:

$$\psi = \begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix}$$



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

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

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

$$\nabla_{\mu} = \partial_{\mu} - i \frac{\mathbf{e}}{\hbar c} \cdot \mathbf{I} \cdot \mathbf{A}_{\mu},$$

$$\mathbf{A}_{\mu} \rightarrow \mathbf{A}_{\mu} + \partial_{\mu} \varphi,$$

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

$$\gamma_{\mu} \left(\partial_{\mu} - i \frac{\mathbf{e}}{\hbar c} \mathbf{A}_{\mu} \right) \Psi + \frac{m c}{\hbar} \Psi = \mathbf{0}. \quad (2)$$

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

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

and represent the gauge invariance using a pseudo-scalar matrix

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

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 $G=g \cdot \gamma_5$ where g is a usual scalar. The Lochak equation for the magnetic charge has the form

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

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. In particular, Equation (4) supports tachyonic solutions. **Doctor Filppov** in his second report will make an attempt to consider the **monopole as a tachyon**. I'd like to stress from the very beginning that, in spite of the standard views, the existence of particles propagating faster than the speed of light (tachyons) does not contradict the Special Relativity Theory. If a particle is produced as a tachyon, it has to annihilate beyond the light cone. One can talk a lot about Lochak's theory but I will stop here and will venture to make a philosophical digression.



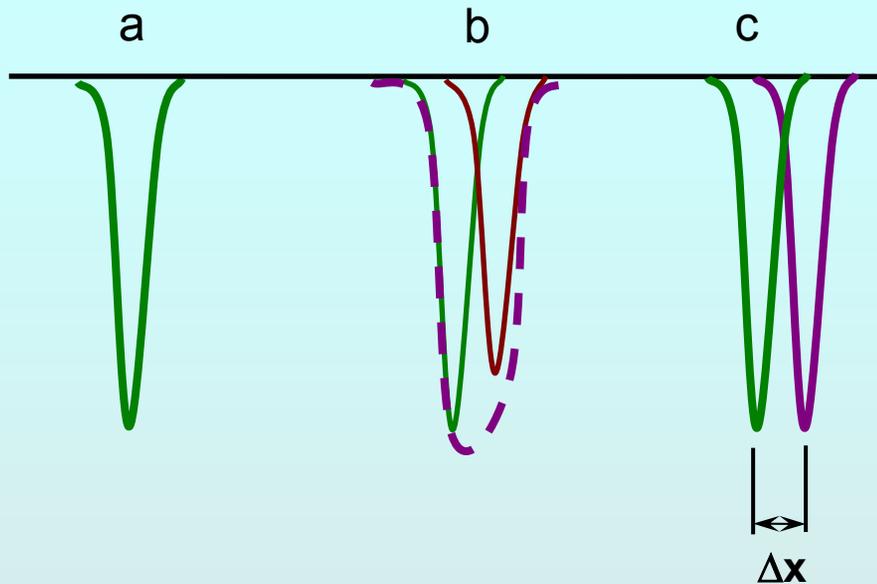
One can ask why Lochak's theory, if it is correct, has not interested anyone for twenty years? The answer to this question is obvious. French physicists are deeply convinced that all genuine physical theories can only be developed outside France. Other physicists usually do not read scientific publications 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 magnetic monopole. Today's physics is reigned by the dictatorship of democracy. I will explain what I mean using a simple example. About five years ago I saw a CERN publication which had around 600 authors. The list of authors was longer than the article itself. As to me, I 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 I would like to return to the main subject of my 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; it means that under a spatial reflection its charge changes its sign. 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? I 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.



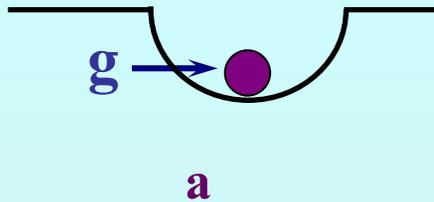
Mössbauer spectrum



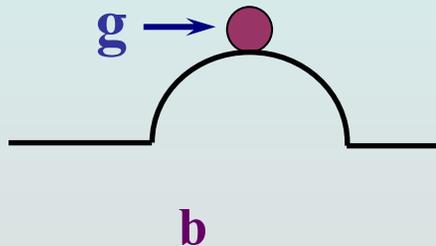
Our experimental search for the monopole started with an attempt to capture it in a ferromagnetic trap. Foil made of iron fifty seven was used as such a trap. The idea was that capture of the monopole by the ferromagnetic will change the field on the Fe^{57} . This in turn will affect the width of **Mössbauer** spectrum lines.

Our experimental search for the monopole started with an attempt to capture it in a ferromagnetic trap. Foil made of iron fifty seven was used as such a trap. The idea was that capture of the monopole by the ferromagnetic will change the field on the iron fifty seven 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 Fe^{57} (containing 6 lines) has not broadened but has only shifted by the same value equal to $\Delta H = 500 \pm 70 \text{ Gs}$. This means that we observe some collective effect. **Doctor Ivoilov** will discuss this subject in detail in his report.

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 isotope is strongly changed. Prof. Rukhadze will tell about our observations in his report.



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



Ammonium nitrate is another example of a system rich in energy. **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. I will only mention that we have observed that the number of stem cells in the animals' marrow changes.



Conclusions

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). I would like to stress that my 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.



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:

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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.



Anri Rukhadze

On the possible magnetic mechanism of shortening the runaway of RBMK 1000 reactor at Chernobyl Nuclear Power Plant

Nikolai Ivoilov

The influence of “strange” radiation on Mössbauer spectrum of Fe⁵⁷ in metallic foils

Dmitry Filippov

- **Effects of atomic electrons on nuclear stability and radioactive decay**
- **Quantum equation of tachyon**

Evgeny Pryakhin

Assessment of the biological effects of “Strange” radiation

Leonid Urutskoev

Study of the gas outburst formed upon electric explosion of titanium foils in liquids