Low Energy Generation of the "Strange" Radiation[1]

N.G. IVOILOV

Kazan State University, Physical Dept, Kazan, Russie
Ivoilov@rambler.ru

At first the term "strange" radiation was used in a paper of L. Urutskoev with co-workers, where in electro-explosive experiments realized on metal wires fixed in a liquid a high-energy radiation has been detected on nuclear photographic plates, located outside of the explosion chamber [1]. In the sediment formed in the liquid an important amount of new chemical elements (up to 10^{19} new atoms) were detected. In this paper it has been established experimentally that the radiation detected is electrically neutral but interacts with a magnetic field. The authors of this paper put forward a prudent supposition that in electro-explosion conditions magnetic monopoles can be born or generated. Later with the use of the conversion Mossbauer spectroscopy it has been shown experimentally that an accumulation effect (with a further effect of relaxation) of this radiation takes place in ferromagnetic films imbedded in the external magnetic field [2]. In the experiments realized [1, 2] the source of radiation was the electro-explosion of metal imbedded into liquid. The discharge parameters of the capacitance battery were the following : the tension 5 kV and the value of the current 150 kA.

In the given work we solved the problem of generation of a similar radiation at low-energy consumptions and investigation of the nature of this phenomenon. For solution of this problem the radiation was studied for two types of generation :

a) in conditions of low-energy electric discharge in a liquid, and

[1] Work presented at the 11th ICCF, Marseille (France), October 31th, 2004.

b) excitation of beta-decay products by a magnetic field.

On experiments of the first type the desired radiation was detected with an electric discharge that was realized between carbon electrodes in a liquid with a value of the current not exceeding 40 A and a voltage of electric arc which was fixed at the level 80 V. In the initial stage of these experiments distilled water was used and the desired discharge was realized in a cylindrical vessel made from thin plastic. A small magnetic field (about 150 Oe) created by Helmholtz induction coils was applied in the plastic vessel (Fig.1.)

Fig. 1. The scheme of the experiment realized

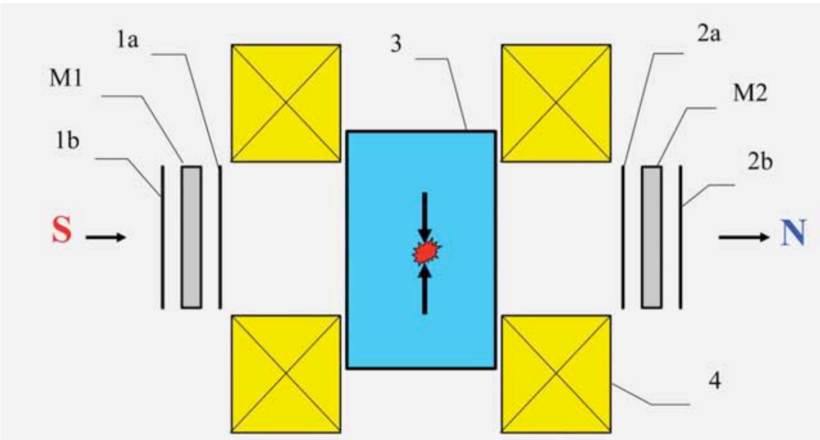

Fig. 1. The scheme of the experiment realized. 1 and 2 –X-ray photoplates, M1 and M2 –the material investigated. 3 –the thin wall plastic vessel, 4 – Helmholtz induction coils. **S** →**N** –direction of magnetic field.

As a detector of radiation we used low-sensitive two-side X-ray photographic plates with the thickness of the sensitive layers 8–10 micrometers and polymer base 180 micrometers respectively. The film having size 5 ×7 cm was enclosed in a double-layer package made from black photo paper fixed perpendicularly to the lines of magnetic field on the distance 10 –15 cm from the source of radiation. After exposing during 3-10 minutes of discharge, the film was developed through standard technology accepted for X-ray films. After that it was analyzed under a microscope with magnification 20 up to 100 with record of the obtained image on a digital camera. Some photos obtained by this manner are given below.

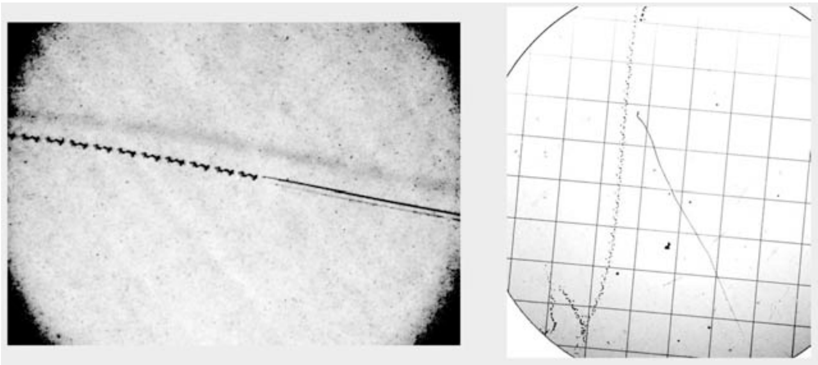

Fig. 2. On this photograph the step is 1 mm.

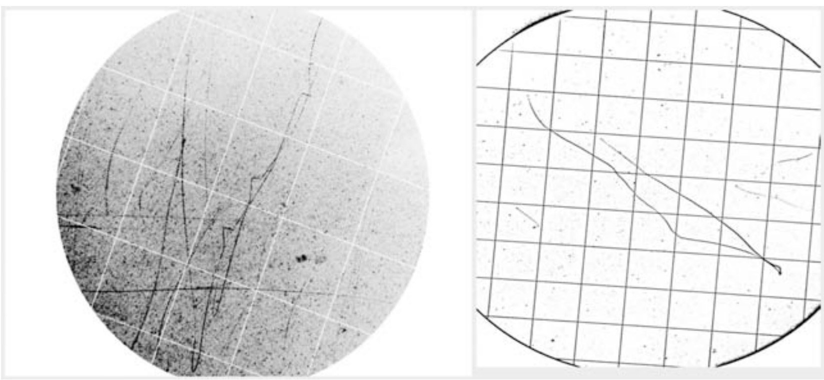

Fig. 3. On this photograph the step is 1 mm.

The tracks given on these pictures are completely identical to the tracks obtained in high-energy electro-explosives conditions. [1].

The long length of the path (sometimes more than 10 mm) of the particles registered in the limits of the thin photo-layer means that these particles interact with boundaries dividing two dielectric medium. The nature of this interaction is not clear and requires additional research.

During these experiments we discovered that addition of glycerol to the distilled water increases the number of registered tracks. Explanation of this fact is probably related with dielectric properties of the liquid mixture used. The optimal concentration lies in the limits of concentration 30 –40%.

Further experiments were performed to study the interaction of the radiation obtained with different substances. On the path of the radiation beam in the north-south direction we used two films and inserted different materials with thickness 50 – 400 micrometers between them. The number of tracks registered by photographic films located on the different sides of materials under investigation helps to estimate the reflective and absorbed properties of materials in relation with this radiation.

The results can be summarized as follows:

1. The number of registered tracks during the fixed time is not constant even if the regime of electric discharge is fixed. This value varies during one day from zero up to 10 tracks during 10 minutes (the area of the films used 35 cm^2). Sometimes tracks are absent during some days round. The reasons of such large deviations are not clear and require additional research.
2. The materials totally absorbing the radiation are ferromagnetic ones as Fe and Ni metal films. These experimental results correspond to the theoretical supposition of V. Martem'yanov and S. Khakimov related to a probable accumulation of magnetic monopoles in ferromagnetics [3], and with the previous results of our research, where such a kind of accumulation has been observed [2].
3. The metal Al shows weak absorption and reflection properties. Based on these properties we replaced the plastic vessel with an aluminium one which is more stable at higher temperatures which are near the boiling point due to the electric discharge.
4. Glass and monocrystalline Si and Ge have good reflection properties.
5. In experiments realized with reflective materials and recording films located before the reflective material we observed pairs of tracks having symmetry with an inversion center. The frequency of such paired tracks is not large and amounts to 5% of the general number of the tracks registered. These double tracks are appearing obligatory on opposite sides of the detecting film, that is easily confirmed by the sharp focusing plane of the microscope. More detailed analysis of the forms of these paired tracks allows to discover some geometrical differences. These discrepan-

cies are increased with the increasing of the distance between the centers of the corresponding tracks.

An example of such paired tracks with the distance 3 mm between them is given on Fig.4 on the background of the 1 mm grid.

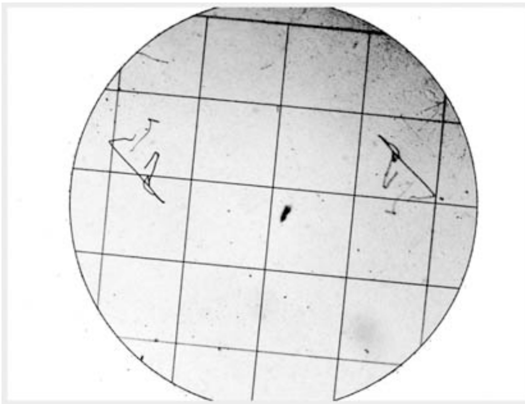

Fig. 4. Symmetrical "pair". The focusing is made on the upper (left) track.

Separate tracks with large magnification (the microscope was focused on the track itself)

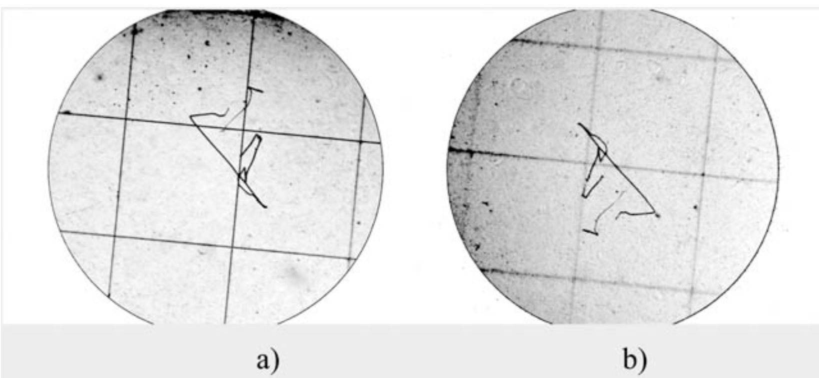

Fig. 5 a) track on the photo film from the side of the source of radiation ; b) the same track registered from the reflector side.

The frequently observed tracks distortion one can explain by the fluctuations of magnetic field created by temporal and spatial instabilities of the electric arc used. Its magnetic field is small (not exceeding 5 Oe) and perpendicular to the external magnetic field. But nevertheless the recorded particles moving along the photographic layer are sensitive to small variations of the magnetic field. The similarity in behaviour of double tracks means that these particles were recorded practically simultaneously on the background of the fast fluctuations of electric arc.

The character of the double tracks obtained makes it reasonable to suppose that the registered pair particles have opposite sign of interaction with the external magnetic field, in other words they have different magnetic charge. Each track from the pair observed has chiral symmetry to the opposite component. Such behaviour of the particles having different magnetic charges one can present graphically on different sides of the film with two photo-layers. (see Fig. 6).

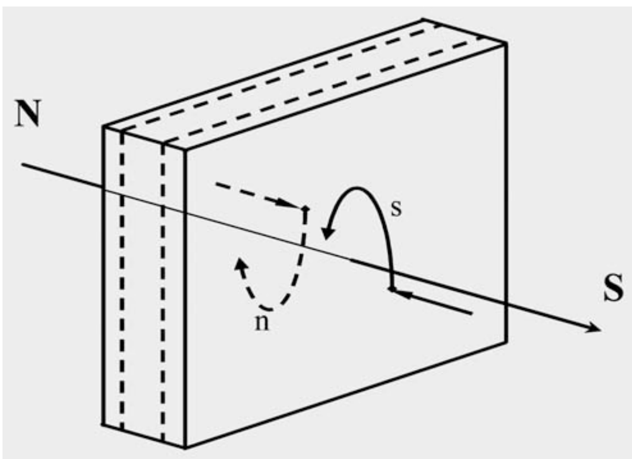

Fig. 6. Behaviour of particles flying in opposite directions along radial fluctuating magnetic field.

The chiral symmetry of magnetic monopoles has been predicted by G. Lochak 20 years ago. [4]. According to his work in contrast to the usual electric charge symmetry “+” and “–”, magnetic symmetry corresponds to the left and right monopoles, i.e. to the south and north magnetic poles, respectively.

It is necessary to note the fact that the registered particle fixed on photographic film is deviated transversely to the initial direction of motion and is moving along the photo layer. From this fact it follows that it is necessary to ascribe to this particle a zero (or close to) mass. Such property coincides again with the characteristic of the Lochak's monopole. In his papers [4,6] magnetic monopole is appearing as a massless solution of the Dirac's equation obeying laws of symmetry obtained by P. Curie for magnetic charge. Being massless or having a very 'light' mass, the magnetic monopole can be born in electromagnetic phenomena and can be interpreted as a magnetically-excited state of neutrino.

The last supposition of G. Lochak is very important and attractive for further experiments. If one can suppose that the recorded particle is Lochak's monopole and taking into account the simplicity of its recording **we performed a direct experiment on excitation of neutrinos radiated in beta-decay of instable nuclei in the presence of a magnetic field.**

As it is known any beta-decay is characterized by emission of two particles (a beta-particle (positron or electron) and a neutrino (or antineutrino)). The decay energy is redistributed arbitrarily between these particles and so the energy of the β-spectrum is continuous. The maximal energy of these particles is defined as the upper limit of beta-decay.

As sources of neutrino we chose two unstable isotopes: Sr^{90} with activity $1{,}2\times10^{6}$ Bq and Cs^{137} with activity $2{,}0\times10^{8}$ Bq. The source Sr^{90} is defined as a pure β-decay source with maximal electron energy 2,2 MeV. The maximal electron energy in the decay of Cs^{137} is 0,52 MeV. The decay of Cs^{137} is accompanied by emission of gamma-quanta with energy 661 keV. This high-energy radiation is absorbed in the detecting film in a small amount and does not produce a strong darkening. The highest contribution to the darkening comes from electrons and Brehmsstrahlung. The maximal radiation treatment time with the source Cs^{137} was 10 min.

On working with photographic films, together with the irradiated films, control films were passed through all stages except the irradiation stage. As control films in this experiment we used photographic films located (during the same time as irradiated films, 10 min) in a constant magnetic field with value 20 kOe. After processing we discovered on the control films the same tracks as we found on the irradiated films recorded during the burning of an electric arc in a liquid. These tracks we defined as the ***control background*** (CB). In the case of location of control films near the source, the CB is not registered. In the presence of magnetic field and the use of the source (Sr^{90}) the number of the registered tracks was increased two-times in comparison with the CB. In this record, part of the tracks has clearly a radial direction from the center where the radioactive source was located. The same result was obtained for the source Cs^{137}.

We performed more than 20 experiments of such kind with our beta sources. The results of these experiments can be summarized as follows:

1. The value of the CB (number of tracks registered on photographic films in magnetic fields without the neutrino source) is unstable in time. The variations of the CB correlate with the quantity of tracks on the irradiated films due to the arc discharge (parallel experiment in the limits of one laboratory). One considers this relationship as a fundamental one and the disclosing of this relationship could bring the understanding of the generation mechanism and the nature of magnetic monopoles at whole. Now one can consider that the source of the CB is the cosmic radiation, which contains unstable particles with beta-decay reaching the Earth surface. As a potential candidate of such unstable particles one can consider μ-mesons [7]. So this CB is associated with a cosmic component.
2. The number of tracks located on the different poles of the electromagnet used practically coincides with each other.
3. The decreasing of magnetic field leads to simultaneous decreasing of the cosmic component and increment of the number of tracks produced by the neutrino source. Undoubtedly, it is interesting to realize similar experiments in strong magnetic fields.
4. In the presence of the cosmic component the source of neutrino in magnetic field increases the number of tracks registered on the film. This increasing one can interpret as a direct proof of the theoretical foresight of G. Lochak about identity of magnetic monopole and magnetically excited neutrino.
5. Approximately equal results obtained for two beta-sources with significantly different activity gives us evidence about the predominant role of unstable cosmic particles participating in the process of generation of magnetic monopoles.

Generalizing results of two sections of this work, it is possible to try to formulate the following basic conclusions.

Conclusions

1. In electro-explosions or discharges in liquid the compressed flowing current serves as a source of large magnetic field. This created field in

turn stimulates the birth of magnetically excited neutrino (monopoles), which are generated in beta-decay process.

2. An unknown component of cosmic radiation serves as a necessary factor of generation of monopoles in the beta-decay of unstable nuclei located in the magnetic field.
3. S-and N-magnetic monopoles are born in pairs.

In the conclusion the author expresses profound gratitude to Dr. L. Urutskoev for useful discussions and to employees of the physics faculty of Kazan state university for their help and support, which he constantly felt during performance of this work.

References

[1] Urutskoev L.I., Liksonov V.I., Cinoev V.G. Experimental detection of "strange" radiation and transformation of chemical elements. Rus Applied Physics, 2000, no 4, 83-100.

[2] Ivoilov N.G., Uruckoev L.I. The influence of "strange" radiation on Mossbauer spectrum of Fe^{57} in metallic foils. Rus Applied Physics, 2004, no 5.

[3] Martemjanov V.P., Hakimov C.H. The inhibition of Dirac monopole into metals and ferromagnetics. Sov. J.Exp.Theor.Phys., 1972, v.62, 35-41.

[4] G. Lochak, Ann. Fond. L.de Broglie, 1983. no 8. p.345; Ann. Fond. L. de Broglie, 1984. no 9. p.5[2].

[5] G. Lochak. Wave equation for a magnetic monopole, IJTP, 24, 1985, p. 1019.

[6] G. Lochak. The symmetry between Electricity and Magnetism and the problem of the existence of Magnetic Monopole. in: Advanced Electromagnetism, Ed. T.W. Barrett and D.M. Grimes, World Scientific publishing Company, Singapore, 1995. p. 105 –147.

[7] B. Rossi. Cosmic Rays. Atomizdat, Moscow, 1965, 236 p.

[2] G. Lochak explicitely predicted the possibility of emission of light magnetic monopoles instead of neutrinos in weak interaction [5].