Time-Dependent Long Range Nuclear Forces

Yu.L. Ratis

Institute of power engineering for special applications

Abstract
It was shown that the experimental results [1–5] provide an evidence for existence of time-dependent long range nuclear forces considered in [6]. Unfortunately, scientific community does not understand revolutionary results [1]–[5] since their interpretation was ambiguous. The original scheme of new "experimentum crucis" is proposed. The aim of this experiment is detection of time-dependent long range nuclear forces with effective radius $r_{\bar{\pi}} > 17$ Å.

Keywords: nuclear forces, theory of exotic electroweak processes, experimentum crucis, exonuclear reactions

1. Introduction

Results [1]–[5] are in a formal contradiction with "the dogmas of modern nuclear physics which are reliably established". At the same time these results perfectly explained within a framework of the theory of exotic electroweak processes (TEEP) [6].

As the results of experiments [1–5] were published in the rare preprints, we will provide extensive cites from these works, accompanying them with comments from TEEP positions.

1.1. A.S. Roussetsky group experiments

International group of scientists investigated exothermic desorption of a deuterium from deuterated heterostructure Au/Pd/PdO:D. They systematically detected α-particles with the energy above 7.5 MeV [1]. The results of this work are presented in fig. 1

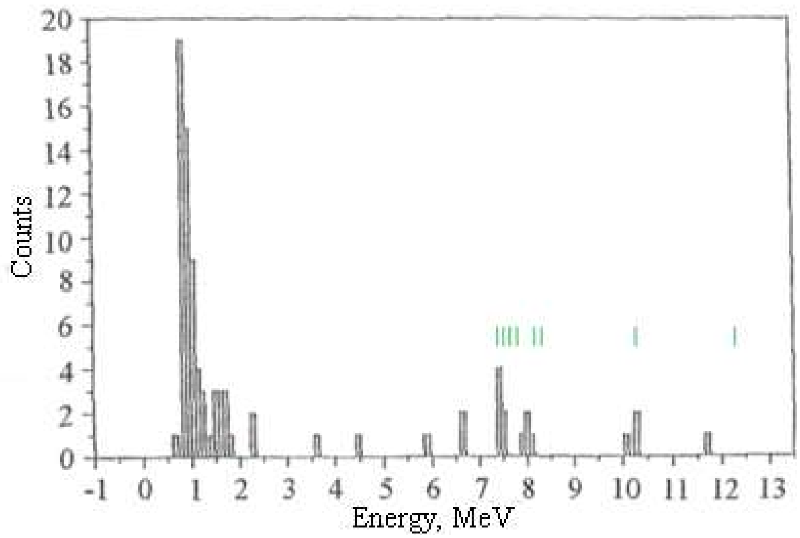

Fig. 1. The typical range of charged particles for Au/Pd/PdO:D samples thickness of l = 40 micron received for time t_D =24000 s. Strokes show the peak positions predicted by TEEP. The results of calculation are seen in Table 1. Peak at ~12 MeV corresponds to the α-particles from reaction $D_\nu + {}^{197}_{79}Au \rightarrow \alpha + {}^{195}_{78}Pt_\nu$.

Results [1] were processed by the TEEP methods [6]. It was established that

1) Exonuclear reaction $D_\nu + {}^{A}_{46}Pd \rightarrow \alpha + {}^{A-2}_{45}Rh_\nu$. A crystal lattice absorbs the recoil momentum. Corresponding energies see in Table 1.

Table 1

Energy of a - particles from $D_n + {}^{A}_{46}Pd$ ® $a + {}^{A-2}_{45}Rh_n$ reaction

Isotope	Abundance	Bound energy	Bound energy	E [MeV]
${}^{102}_{46}Pd$	0.96	875.246	857.550	8.377
${}^{104}_{46}Pd$	10.95	892.874	874.879	8.078
${}^{105}_{46}Pd$	22.23	899.947	884.189	10.315
${}^{106}_{46}Pd$	27.33	909.508	891.188	7.753
${}^{108}_{46}Pd$	26.80	925.275	906.750	7.548
${}^{110}_{46}Pd$	12.08	940.232	921.560	7.401

2) Reaction with ${}^{197}_{79}Au$. The recoil momentum is partially accepts by the affiliated nuclei ${}^{195}_{78}Pt$. Besides, α-particles, which are products of reaction $D_\nu + {}^{197}_{79}Au \rightarrow \alpha + {}^{195}_{78}Pt_\nu$, come from depth of heterostructure of Au/Pd/PdO:D (H), and lose a part of energy by passing through a foil.

$$D_\nu + {}^{197}_{79}Au \rightarrow \alpha + {}^{195}_{78}Pt_\nu + 12.397 \text{ MeV}$$

It is evident that TEEP allows to calculate correctly not only schemes of the "forbidden" reactions, but also predicts α-peaks positions (see fig. 1).

1.2. D.S. Baranov's experiments

D.S. Baranov detected [2–3] radioactive isotopes of bismuth and polonium at a spark electric discharge in solution of $({}^{209}_{83}BiNO_3) \times 10H_2O$ Место для формулы. (see fig. 2).

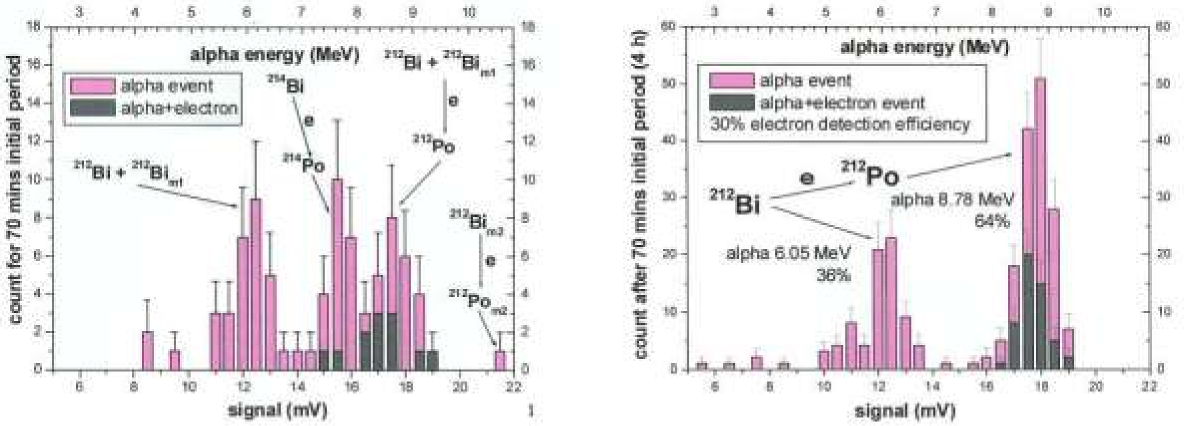

Fig. 2. Left histogram. The α-particles count rate at initial 70 minutes. Right histogram. The α-particles count rate after initial 70 minutes.

From the point of view of TEEP D.S. Baranov's reactions took place according to schemes

$$({}^{209}_{83}BiNO_3)_\nu \rightarrow {}^{210}_{84}Po + {}^{61}_{30}Zn_\nu + 31.645\ MeV \quad (1)$$
$$({}^{209}_{83}BiNO_3)_\nu \rightarrow {}^{212}_{84}Po + {}^{59}_{30}Zn_\nu + 22.287\ MeV \quad (2)$$
$$({}^{209}_{83}BiNO_3)_\nu \rightarrow {}^{214}_{84}Po + {}^{57}_{30}Zn_\nu + 22.259\ MeV \quad (3)$$
$$({}^{209}_{83}BiNO_3)_\nu \rightarrow {}^{212}_{83}Bi + {}^{59}_{31}Ga_\nu + 20.822\ MeV \quad (4)$$
$$({}^{209}_{83}BiNO_3)_\nu \rightarrow {}^{214}_{83}Bi + {}^{57}_{31}Ga_\nu + 19.765\ MeV \quad (5)$$

Index n in formulas (1)–(5) means that one of protons in the corresponding nuclei is replaced by neutroneum.

1.3. A.Yu. Didyk's experiments

One of the main puzzles of modern nuclear physics is carbon creation [4] in the high pressure helium irradiated by γ-quanta with energy of an order of 10 MeV.

The high pressure helium in the chamber (fig. 3) was irradiated by the bremsstrahlung γ-quanta with threshold energy of 10 MeV during $1.0 \cdot 10^5$ s [5].

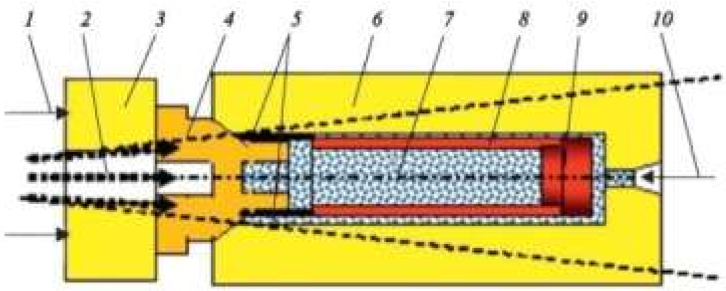

Fig. 3. The elements of a chamber of a high pressure of helium (HeHPC) used at radiation by bremsstrahlung γ- quanta. *1- screw* clamping consolidation (a cone 60°/58 °) which is not shown in this drawing; 2- stream γ- quanta with the section of 6 mm through passage; 3- $Cu_{1-X}Be_X$ - an entrance window into which the screw is inserted clamping; 4- entrance window γ- quanta; 5 - area in which were found "carbon" a foil; 6- chamber of a high pressure from $CuBe_2$ with the external protective steel cylinder, it is not shown in drawing; 7- helium; 8- copper reactionary chamber (99.99% copper); 9- copper collection of products of reaction closing a reactionary chamber; 10- device for loading and unloading of gas and for measurement of its pressure at control and in the course of radiation.

Initial pressure of gaseous helium was about 1.1 kbar. An electron beam current fluctuated in the range 22–24 mA.

When *HeHPC* had been opened after irradiation the residual pressure of helium was equal 426 bar. Inside *HeHPC* a foil of black color and other multiple objects were observed on internal surfaces of the reaction chamber. The chamber itself was made of high purity (99.99%) copper, its entrance window for γ-quanta was made of beryllium bronze and there was the copper collector for products of nuclear and chemical reactions. The materials collected from an internal surface of the chamber, the entrance window and the product collector have been studied by the x-ray analysis and other methods in two independent analytical centers: in NIIYaF of D.V. Skobeltsyn of Lomonosov Moscow State University (ATs-I) and FGBNU "Scientific research institute PMT"(ATs-II).

The performed measurements showed that foil consist generally of carbon, and, in smaller quantities, of other elements (from carbon to iron).

The most striking result of this experiment was that about 50% of initial helium turned into carbon!

From the point of view of orthodox nuclear physics there was simply impossible. However according to TEEP the exotic reaction of the induced electronic capture which is not followed the neutrino's emission (i.e., neutroneum creation reaction) "switched on" long range nuclear forces. As a result multinuclear fusion reactions become allowed, as it observed in this experiment.

The detailed analysis of experiments [4–5] showed that the effective radius of exonuclear forces exceeds $r_{\bar{p}} > 17\ E$.

2. Description of the scheme of new experiment

To check the hypothesis on existence of the time-dependent long range nuclear forces the following reaction which is strictly forbidden by a Coulomb barrier is offered:

$$e^{-} + 2\,{}^{209}_{83}Bi \rightarrow ({}^{418}_{166}X)_{\nu} \rightarrow {}^{208}_{82}Pb + {}^{206}_{82}Pb + {}^{4}_{2}He + e^{-} + 6.5923\ MeV \qquad (6)$$

For its implementation there is necessary to make an electron beam tube (fig. 4) in which as the screen a chemically pure bismuth foil is used.

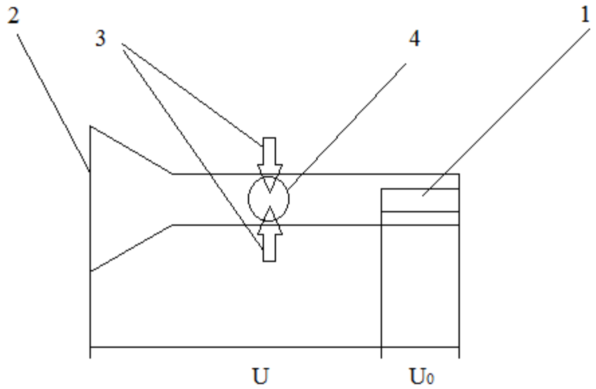

Fig. 4. Measuring part of installation. 1. Electron beam gun (cathode knot); 2. The bismuth foil screen. 3. Electrodes for checking of emergence of helium in volume of an electron beam tube; 4. A window for the analysis of optical spectra.

The recommended voltages are $U_0 \sim 30$ kV and $U \sim 1$ kV. Exposition time is more than 3 days. The vacuum in electron beam tube has to be of order 10^{-6} Torr. It is also, whenever possible, sustained under vacuum so the absence of helium in residual gases was guaranteed.

At an electric discharge between electrodes 3 a helium lines in an optical spectrum have to appear.

Experiment, as a matter of fact, repeats the well-known Rutherford–Soddi experiment in which transmutation of chemical elements was discovered.

Conclusion

It is necessary to wait for results of experimentum crucis.

Acknowledgments

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