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The Neutron Lifetime at the Change of Gravitational Medium

(The proposal for space experiment)

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We propose to measure the life-time of thermal neutron at the height h (100÷1000 km). It is expected the appreciable deviation of dependence on h (1–2 order of magnitude higher than the experimental error).

In spite of the fact that the lifetime of a free (thermal) neutron and the half-decay periods of α, β^-, β^+ are well investigated experimentally, however, since all these measurements were done at the Earth's surface (in practically invariable gravitational field), we consider necessary to check up it at the outside of the Earth, in the feeble gravitational medium.

We propose the measurements of the lifetime of thermal neutron simultaneously on the Earth and in a spaceship, at sufficient distance from the planet, from 100 to 1000 km, by means of two identical installations and natural or artificial radioactive sources of neutrons. It is desirable that during this experiment (on the Earth and in the spacecraft) the half-life periods α, β^-, β^+ would be measured equally. It is important also that the time of measurement and the half-life period of isotopes would be comparable (50–200 days).

The idea of this experiment is not the new one: it has resulted from the discussion of the review "The spiral geometry in natural sciences: phase transitions of space-time and matter" [1], where the new spatially-temporary physical Mega- and micro-media, motion, the origination, decay and annihilation of particles, and also an electrical charge and gravitational mass, the Coulomb and gravitational attractive forces, closely related to spirally-geometrical features of physical space and time, are represented. Long time in the course of our attention there were the Mega-space and Mega-time problems (Galaxies, Solar system), described in [2] and [3]. Confidence in actuality, first of all, was stipulated by the Internet-communication of A.P. Serebrov "Basic Researches with the Ultracold Neutrons"[4], where in harmony with our approach and hopeful was that at the high-precision measurements of 2004 (collaboration of PINP and JINR), done by the gravitational entrapment of ultracold neutron [5], the lifetime 878.5 ± 0.8 sec has been registered, with a standard deviation 6.5 from tabular data (918±14 sec average life-time of neutron [6]).

Trustworthy that the measurements of 2007 of other independent group in PINP, using the magnetic trap method (878.4 ± 1.8 sec), have confirmed the previous result [4].

The cause that the control measurements in the gravitational medium essentially differing from the surface of Earth till now are not executed yet is conditioned, in our opinion, by the up-to-date models of a nuclear physics which do not suppose the possible influence of a gravitational field on the decay of the free neutron. Till now we practically know nothing about a gravitational field and its display in the micro- and Mega-spaces. Other hindrance is the high cost of the space experiment.

Stated above it is not caused by a fundamental principle of experimentum crucis. There are also the problems related to some approaches for physical micro- and the Mega-worlds, which, unconditionally, deserve separate discussion. We note only that as a result of this experiment we expect:

1. The appreciable (1-2 order of magnitude higher than the experimental error) decrease in the lifetime of free neutron, besides with discrete transitions, accordingly to the distance from the Earth.
2. The decrease in a half-life period α-radiation of radioactive nuclei. Depending on the type of atom, we do not exclude also the possible changes of mechanisms of spontaneous decay.
3. Inactivity of electronic β^- decay, half-life period growth.
4. Activation of positron β^+-decay, half-life period decrease. The probability of electronic K-capture by nucleus will also increase.

Not grounding in this report the approach and forecasts of proposed experiment, which will be made later, for the present, as the basic hypothesis we note that the inertial motion in physical space is the result of interaction of space and the bodies characterized by gravitational mass. At the same time, the neutron is responsible for gravitational, and for inertial mass. As to the practical stability of the neutron in nucleus it is caused by quantization of formation time of neutron-proton groups creating conditions for the stable state of nucleus.

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