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Research of fundamental interactions with use of ultracold neutrons in PNPI NRC KI

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Use of ultracold neutrons (UCN) gives unique opportunities of a research of fundamental interactions in physics of elementary particles. Search of the electric dipole moment of a neutron (EDM) aims to test of theories of CP violation. Precision measurement of neutron lifetime is extremely important for cosmology and astrophysics. Considerable progress in these questions can be reached due to supersource of ultracold neutrons on the basis of superfluid helium which is under construction now in PNPI NRC KI. This source will allow to increase density of ultracold neutrons approximately by 100 times in respect to the best UCN source at high flux reactor of Institute Laue-Langevin (Grenoble, France). Now the project and basic elements of a source are prepared, full-scale model of a source is tested, the scientific program is developed. Increase in accuracy of neutron EDM measurements by order of magnitude, down to level 10ˆ-27 - 10ˆ-28 e cm is planned. It is highly important for physics of elementary particles. Accuracy of measurement of neutron lifetime can be increased by order of magnitude also. At last, at achievement of UCN density ˜ 10ˆ3 – 10ˆ4 cmˆ-3, the experiment search for a neutron-antineutron oscillations using UCN will be possible. The present status of the project and its scientific program will be discussed.

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