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Simulation of the experimental program with ultracold neutrons and neutrino at the PIK reactor

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Monte Carlo simulation of the complex of research with ultracold neutrons at the PIK reactor (Gatchina, Russia) is carried out. The complex is being built on the basis of a high-intensity source of ultracold neutrons at the GEK-4 channel. A Monte Carlo model has been developed, which includes a source, a neutron guide system and experimental installations, taking into account their real location in the main hall of the reactor. With the help of calculations, the sensitivities of measuring installations for the search for the electric dipole moment of the neutron and for the measurement of the neutron lifetime at the PIK reactor were obtained. Monte Carlo simulation of the new reactor antineutrino detector of the Neutrino-4 experiment at the PIK reactor is carried out. The scintillation-type detector is based on the inverse beta-decay reaction. As a result of the simulation, the distributions of photomultiplier signals from the positron and the neutron are obtained. The efficiency of the detector depending on the signal recording thresholds is calculated. A simulation of results expected with employing of spectral independent method of data analysis is done taking into account geometric configuration of the reactor core and detector.

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