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Ultracold neutron source based on superfluid helium for the PIK reactor

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New ultracold neutron source based on superfluid helium is being constructing at the PIK reactor for researches in the field of fundamental interactions physics. The use of superfluid helium will allow achieving an UCN density in the source chamber of 3400 cm^{-3} , which is an order of magnitude higher than the current UCN density in sources around the world. To create this UCN source some important technologies has been developed and implemented: obtaining and maintaining superfluid helium at low temperatures under conditions of heat influx from the reactor, manufacturing neutron guides with a high UCN reflection coefficient, developing heat exchangers for ultra-low temperatures and obtaining isotopically pure helium-4. The UCN source neutron guide system is designed for four scientific stations. During the first stage of the source's operation, it is planned to install an EDM spectrometer with a measurement sensitivity of $1\text{E-}27 \text{ e-cm/year}$ and two experiments to measure the neutron lifetime with an accuracy of 0.1 seconds using gravitational and magnetic traps.

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