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# Development and implementation of technologies for a new ultracold neutron sources based on superfluid helium

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The use of ultracold neutrons (UCNs) creates new opportunities for experiments to study the fundamental properties of the neutron. The use of superfluid helium for converting cold neutrons into ultracold one is very promising. It is based on the accumulation of UCNs in superfluid helium due to the properties of this quantum liquid. Our UCN source aims to obtain a record UCN density of 2200 cm-3, which is at least two orders of magnitude higher than the existing UCN density level used in experiments in the world at the moment. To obtain the record ultracold neutron density, unique technologies for creating a new ultracold neutron source have been developed and implemented: obtaining isotopically pure helium-4 to eliminate the neutron-absorbing isotope 3He, obtaining and maintaining superfluid helium at a temperature of 1 K under reactor heat flux conditions, and manufacturing UCN neutron guides with high reflection intensity to increase the amount of UCN delivered to experimental facilities. By the end of the project, we expect to have an extensive research program in the physics of fundamental interactions established at the new UCN source.

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