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Latest Achievement on the UCN source of the TRIUMF Ultracold Neutron and the EDM Experiment

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A non-zero electric dipole moment of the neutron (nEDM) would violate the CP symmetry and be related to baryon asymmetry in our universe. The TRIUMF Ultracold Advanced Neutron (TUCAN) collaboration is commissioning a world-leading ultracold neutron (UCN) source for such precise measurements of the nEDM. With such an intensive UCN source, the TUCAN collaboration aims to push the statistical nEDM measurement sensitivity to the scale of 10^{-27} e·cm within 400 days. Spallation neutrons will be cooled with room temperature heavy water and 20K liquid deuterium, after which, the UCNs will be produced in a spherical volume in 1K superfluid helium. These UCNs are then extracted from the production volume and introduced to the experimental equipment with coated vacuum neutron guides. Once the source is completed, it will provide a UCN production rate of 1.6×10^7/s.

The UCNs produced from the source will be transferred to the storage unit, and the nEDM will be measured later by the Ramsey resonance technique with separated oscillating magnetic fields. This source can also be applied to other experimental proposals, such as neutron lifetime measurement or the search for axion-like particles. This presentation will focus on the latest achievement on the UCN source commissioning and the nEDM experiment at TRIUMF, including initial UCN production results from operating the superfluid He-II source prior to installation of the LD2 moderator.

Research field of your presentation

Experimental Low-energy nuclear physics

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