

Performance of the ultracold neutron source at PSI and the search for an electric dipole moment of the neutron

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On behalf of the PSI UCN Team and the nEDM collaboration

Ultracold neutrons (UCN) can be stored in suitable vessels for hundreds of seconds and therefore serve as excellent probe for fundamental physics experiments, probing e.g. the properties of the neutron, gravity, extra forces, or other physics beyond the Standard Model scenarios. Such experiments have in common the need for high UCN intensities.

At the Paul Scherrer Institute, Switzerland a new ultracold neutron source [1] was built. Based on superthermal UCN production in about 30 liters of solid deuterium at 5 K [2], UCN can be delivered to three beam ports in regular operation. Scientific proposals are now being invited. We will report on the characterization measurements, the achieved intensity improvements, and the experience gained in operating the UCN source. At the same time the experiment to search for a permanent electric dipole moment of the neutron (nEDM) [3] is being operated by an international collaboration. The present apparatus uses the setup which led to the best nEDM limit so far [4], but was afterwards substantially improved. Data-taking started in 2013. In parallel a new apparatus with two precession chambers is being developed aiming at another order of magnitude increase in sensitivity. We will report on the performance of our experiment, its status and give an outlook.

References

- [1] B. Lauss, *Hyperfine Interactions* 211 (2012) 21-25.
- [2] K. Kirch et al., *Nuclear Physics News* 20, 1 (2010) 17.
- [3] C.A. Baker et al., *Physics Procedia* 17 (2011) 159-167.
- [4] C.A. Baker et al., *Physical Review Letters* 97 (2006) 131801.

Primary author: Dr LAUSS, Bernhard (Paul Scherrer Institute)

Presenter: Dr LAUSS, Bernhard (Paul Scherrer Institute)