

A new oscillating detector for monitoring the velocity spectrum of ultracold neutrons and its time evolution

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The velocity spectrum of ultracold neutrons (UCN) is an important factor in characterizing a UCN source and in determining the systematic effects in precision measurements utilizing UCNs, most prominently the search for an electric dipole moment of the neutron [1]. The oscillating ultra-cold neutron spectrometer (OTUS) [2] is a new tool designed for monitoring the velocity distribution and its time evolution in different places of the transport system connecting a UCN source with experiments. We will present the applied detection and analysis methods with the current status of the project, including measurements using the oscillating spectrometer installed at different UCN beamports of the UCN source at the Paul Scherrer Institute (PSI). The obtained results will be compared to the available TOF method results [3] and a detailed Monte Carlo simulation [4]. Especially, the results from the spectrum measurements performed in a large storage tank filled by the PSI UCN source and the spectrum time evolution for different UCN storage times will be demonstrated.

References:

- [1] C. Abel, et al., Phys. Rev. Lett. 124, 081803 (2020).
- [2] D. Rozpedzik, et al. arXiv:2212.01902 (2022).
- [3] G. Bison, et al. arXiv:2301.11668 (2023).
- [4] G. Bison, et al. EPJ A 58, 103 (2022).

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