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Experiments for an Ultracold Neutron EDM Search

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Content:

Ultracold neutrons (UCN) are neutrons that are moving so slowly that they can be confined to traps by material, magnetic, and gravitational walls. We are constructing a new UCN source at TRIUMF using new technology based on UCN production in superfluid helium. One of the experimental physics projects proposed to be done using the UCN source is a search for a non-zero neutron electric dipole moment (nEDM). Measurements of electric dipole moments already severely limit new sources of CP violation beyond the standard model. If a non-zero nEDM were discovered at the level of experimental precision of a new experiment, it would signify a new source of CP violation. I'll review our progress towards the development of this exciting experiment. This will focus on experiments completed in the past year using UCN produced at our prototype source in Japan. The experiments revolved around production, storage, polarization, and manipulation of the spins of UCN. The measurements culminated in the achievement of a Ramsey-resonance spectrum, which demonstrates the method used to precisely measure the spin-precession frequency of the neutrons. The experiments indicate a roadmap to achieve the precision necessary to make a

world-class measurement at TRIUMF.

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