

Search for the Neutron Electric Dipole Moment on SNS

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This project invokes a new technique for searching for the electric dipole moment(EDM) of the neutron. It is based on the magnetic-resonance technique in which the magnetic dipole moment of a neutron is placed in a plane perpendicular to parallel magnetic and electric field. The impact of the electric field on the precession of the neutron is characterized by the first moment of the neutron charge distribution, d_n , its EDM. In principle, this new type of EDM experiment can achieve more than two orders of magnitude improvement in the experimental limit for the neutron EDM in conjunction with the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory. This factor results from the possibility of an increased electric field due to the excellent dielectric properties of superfluid ^4He , an increase in total number of ultracold neutrons (UCNs) stored and an increased storage time due to the low temperature of the walls. The UCN needed for this experiment are produced via the superthermal method in superfluid ^4He at a temperature below 0.5 K. The use of spin polarized ^3He as a volume co-magnetometer is crucial to the elimination of the magnetic-field systematics. With the proposed experiment, an EDM limit of 10^{-28} e-cm is possible.

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