

Abstract Submitted
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Design of a magnetic field mapping rover system for a neutron lifetime experiment MATTHEW LIBERSKY, Los Alamos National Laboratory, UCNTAU COLLABORATION — The beta decay lifetime of the free neutron is an important input to the Standard Model of particle physics, but values measured using different methods have exhibited substantial disagreement. The UCN τ experiment in development at Los Alamos National Laboratory (LANL) plans to explore better methods of measuring the neutron lifetime using ultracold neutrons (UCNs). In this experiment, UCNs are confined in a magneto-gravitational trap formed by a curved, asymmetric Halbach array placed inside a vacuum vessel and surrounded by holding field coils. If any defects present in the Halbach array are sufficient to reduce the local field near the surface below that needed to repel the desired energy level UCNs, loss by material interaction can occur at a rate similar to the loss by beta decay. A map of the magnetic field near the surface of the array is necessary to identify any such defects, but the array's curved geometry and placement in a vacuum vessel make conventional field mapping methods difficult. A system consisting of computer vision-based tracking and a rover holding a Hall probe has been designed to map the field near the surface of the array, and construction of an initial prototype has begun at LANL. A description of the design and prototype will be presented.

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