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UCNA and UCNB: Using ultracold neutrons to measure the beta-asymmetry and neutrino-asymmetry at LANSCE

The Ultracold Neutron (UCN) program at the Los Alamos Neutron Science Center has developed one of the highest density sources of UCN in the world to perform precision measurements of neutron decay observables. The UCNA collaboration has recently published a sub-percent measurement of the beta-asymmetry, $A_0 = -0.11954(55)_{stat}(98)_{sys}$, used to extract $\lambda = g_A/g_V = -1.2756(30)$, the ratio of the axial-vector and vector coupling constants. We are now analyzing data from the latest run cycles which implemented significant improvements to reduce all major systematic effects.
The UCNB experiment will use thick, large-area, highly segmented silicon detectors installed in the existing UCNA spectrometer to detect protons and electrons in coincidence in order to extract the antineutrino-asymmetry B, used to place limits on non-Standard Model scalar and tensor interactions. UCNB has demonstrated the capability for very low noise operation at 20˜kV bias voltage and 1˜T magnetic field. We expect to observe the first electron-proton coincidences from neutron decay in the 2013 run cycle with up to 24 pixel segments instrumented on each detector, and begin to characterize systematic effects to achieve our preliminary goal of a 0.1% uncertainty measurement. We will present progress on the development of these experiments and the latest updates from the beginning of the 2013 beam cycle.

Summary

We will present an overview of and results from the UCNA and UCNB experiments.

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