

New Results from the UCNA Experiment

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The primary goal of the UCNA experiment is to provide, using polarized ultracold neutrons (or UCN), a high precision measurement of the axial coupling constant in neutron decay, g_A . High precision predictions for neutron decay in the Standard Model can be achieved with just two measurements: one to fix the absolute vector coupling strength, and one to determine g_A . These parameters play a critical role in a variety of physics scenarios, such as big bang nucleosynthesis, high precision models of the solar fusion rate, and high precision modeling of reactor neutrino fluxes. Neutron measurements also provide input for constraints on a variety of extensions to the Standard Model, in many cases at, or beyond, the sensitivity ultimately expected from the Large Hadron Collider. Although the vector coupling strength can be obtained from super-allowed nuclear decays, neutron decay is the definitive source for high precision values of g_A . UCNA is designed to determine g_A through a measurement of the angular correlation between the neutron spin and the momentum of the emitted beta particle, known as the beta asymmetry. UCNA is also the first angular correlation measurement to utilize UCN to control key sources of systematic error: the neutron polarization and neutron-generated backgrounds. We present here the results of 2011–2013 running at the Los Alamos Neutron Science Center and place our results in the context of the world data set.

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