

HAW09-2009-000814

Abstract for an Invited Paper
for the HAW09 Meeting of
the American Physical Society

High Precision Measurements of Neutron Beta-Decay at LANSCE

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High precision measurements of neutron beta-decay can be used to study the standard model of particle physics by testing the unitarity condition of the CKM matrix. Precise measurements of the neutrons' lifetime and one of its angular correlations are needed to determine the necessary standard model parameters for a unitarity test from neutron decay alone. Several experiments are underway at the Los Alamos Neutron Science Center (LANSCE) to measure these parameters using Ultra-Cold Neutrons (UCN). During the last 10 year a program to study neutron physics with UCN has been under development at LANSCE by an international team of scientists. The first experiment of this program, UCNA; which measures the decay correlation between the polarized neutron and the resulting beta particle, is currently running. A neutron lifetime experiment that monitors the decay rate of UCN trapped in a magnetic bottle with a gravitational top is being built and scheduled to run later this year. A second decay correlation experiment; (UCNB), which will measure the decay correlation between the polarized neutron and the resulting anti-neutrino is currently in the research and development phase. This talk will give an overview of these experiments, as well as other highlights from the UCN program at LANSCE.

¹for the UCNA, UCNB and UCN Lifetime collaborations