Silicon Semiconductor Detector Dead Layer Characterization using Po^{210} α-source

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The purpose of this experiment is to determine dead layer thickness in a solid silicon semiconductor detector. Shifts in angle of incidence on the detector will prompt changes in flight path and energies measured due to transmission. These changes in energy and flight paths provide direct relationships to energies lost in transmission. By measuring the total energy Polonium-210 α particles lose during penetration, absolute dead layer thickness is calculated. Indirectly the experiment also determines efficiency given this energy loss.

Analysis of a Magnetic Field Map of the UCNτ Magnetic Array

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The precise value of the mean neutron lifetime, τ_n, plays an important role in nuclear and particle physics and cosmology. It is a key input for predicting the ratio of protons to helium atoms in the early universe as well as for searching for new physics beyond the Standard Model of particle physics. Using a magnetic storage trap, the UCNτ experiment stores neutrons for different holding times before counting the surviving ultracold neutrons. The UCNτ experiment is focused on finding the neutron lifetime with a final precision of ±0.1 s, and at present has measured $877.7 \pm 0.7(\text{stat}) + 0.4/-0.2(\text{sys})$ s. The experiment described here will help further define the systematic error caused by neutron depolarization, which can cause neutrons to escape the trap. Combined with other ongoing experiments to lower the overall systematic uncertainty, it will help support the most precise neutron lifetime to date.