Abstract Submitted
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The in-situ detector for the UCNτ Neutron Lifetime Experiment[1]
CHRIS CUDE-WOODS, Los Alamos National Laboratory — We will present the design and the performance of the in-situ neutron detector used in the UCNτ experiment. When inserted into the UCNτ trap at the end of each neutron storage period, the detector counts the surviving ultracold neutrons with a high efficiency over 10 seconds. It can also be placed at various heights to monitor changes in the phase space distribution of trapped neutrons. The detector is a large-area scintillating sheet coupled to wavelength-shifting fibers bundled and read out by two photomultiplier tubes. Low-energy neutrons are captured on a thin ^{10}B layer (nominally 25nm) deposited on a ZnS:Ag screen. The resulting alpha particles and Li ions generate scintillation light in the ZnS. Due to the low light collection efficiency of the fiber arrangement, we record individual photon arrival times. The long ZnS scintillation decay time (several micro-seconds) presents challenges for event reconstruction at high neutron capture rates and can lead to significant corrections as the UCNτ apparatus routinely traps 40K neutrons. We will discuss several rate-dependent corrections and compare two methods of lifetime analysis, one based on event reconstruction and the other on single photon counting.

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