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Characterization of Systematic Effects in a Measurement of the Free Neutron Lifetime Using the UCNτ Magneto-Gravitational Trap A.T. HOLLEY, Tennessee Technological University, UCNτ COLLABORATION — Measurement of the free neutron lifetime with a precision on the order of 1 s (0.1%) has been demonstrated to be experimentally feasible, but the current uncertainty in our knowledge of the neutron lifetime is significantly poorer, dominated by a nearly 8 s (4σ) discrepancy between two complementary measurement techniques: the slow-neutron "beam" approach and the "bottle" method, which measures the number of surviving ultracold neutrons (UCN) following storage in a suitable trapping potential. The UCNτ collaboration has constructed a large-volume magneto-gravitational trap expected to reduce systematic effects associated with previous bottle measurements, which utilized material traps and external UCN detectors. Our strategy eliminates material interactions during UCN storage using permanent NdFeB magnets in a bowl-shaped Halbach configuration to trap UCN from the sides and below, and the earth's gravitational field to trap them from above. Surviving UCN are counted using an *in situ* integrating activation detector that rapidly absorbs UCN in the trap. Ongoing efforts to investigate the residual systematic effects associated with our experimental configuration will be discussed.

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