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Magnetic Field Characterization of the UCNτ Magneto-gravitational Ultracold Neutron Trap[1] ADAM HOLLEY, Tennessee Technological University, UCNTAU COLLABORATION — The UCNτ experiment employs a large-volume magneto-gravitational trap to measure the free neutron lifetime by counting surviving ultracold neutrons (UCN) following storage in a combined magnetic and gravitational potential. In this "bottle" approach, loss of UCN from any non-β-decay process produces a systematic error. Magnetic field gradients generated by, for example, an array of permanent magnets can be used to confine polarized UCN, eliminating wall interactions that lead to such losses, the dominant systematic effect in non-magnetic (material) bottles. What remains is a small residual systematic effect associated with the dynamics of UCN spin in the trap. Assessing both the effectiveness of the trapping potential at preventing wall collisions, as well as spin dynamics, requires measuring the magnetic field with $\sim$mm spatial precision near the surface of the trap. We have constructed an automated magnetic mapper capable of performing *in situ* magnetic field maps of the UCNτ Halbach array with high spatial precision, and are engaged in an ongoing mapping campaign to characterize the UCNτ trap. We will describe this instrument, present a first set of detailed scans, and discuss implications for magnetic field related systematic effects.

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