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Development of a Large-Area Ultracold Neutron Detector JENNA STOFFEL, CHEN-YU LIU, Indiana Univ - Bloomington, UCN TAU COLLABORATION — To improve our knowledge in particle physics and cosmology, including big-bang nucleosynthesis, we need a more precise and accurate measurement of the lifetime of free neutrons. Though there have been many attempts to measure the neutron lifetime, discrepancies exist between the two major experimental techniques of the beam and the bottle methods. To resolve this discrepancy, the UCNτ experiment will trap ultracold neutrons (UCNs) to perform lifetime measurements to the 1-second level. To accomplish this goal, we are developing a large-area, high-efficiency UCN detector. We construct a scintillating UCN detector by evaporating a thin film of boron-10 onto an airbrushed layer of zinc sulfide (ZnS); the ^{10}B-coated ZnS scintillating film is then glued to wavelength-shifting plastic, which acts as a light guide to direct photons into modern silicon photomultipliers. This new detector has similar efficiency and background noise as the previously-used ion gas detectors, but can be easily scaled up to cover large areas for many applications. The new detector opens up exciting new ways to study systematic effects, as they hold the key to the interpretation of neutron lifetime.

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