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Optimization of a Light Collection System for use in the Neutron Lifetime Project C. TAYLOR, C. O'SHAUGHNESSY, P. MUMM, A. THOMP-SON, P. HUFFMAN, NCSU/NIST COLLABORATION — The Ultracold Neutron (UCN) Lifetime Project is an ongoing experiment with the objective of improving the average measurement of the neutron beta-decay lifetime. A more accurate measurement may increase our understanding of the electroweak interaction and improve astrophysical/cosmological theories on Big Bang nucleosynthesis. The current apparatus uses 0.89 nm cold neutrons to produce UCN through inelastic collisions with superfluid 4He in the superthermal process. The lifetime of the UCN is measured by detection of scintillation light from superfluid 4He created by electrons produced in neutron decay. Competing criteria of high detection efficiency outside of the apparatus and minimum heating of the experimental cell has led to the design of an acrylic light collection system. Initial designs were based on previous generations of the apparatus. ANSYS was used to optimize the cooling system for the light guide by checking simulated end conditions based on width of contact area, number of contact points, and location on the guide itself. SolidWorks and AutoCAD were used for design. The current system is in the production process.

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