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Monte Carlo Simulation of New UCN Source at LENS PATRICK MCCHESNEY, Indiana University Cyclotron Facilitiy, LENS UCN-SO2 COLLABORATION — My research has focused on a Monte Carlo study of a new ultracold neutron (UCN) source under development at the Low Energy Neutron Source (LENS) at the Indiana University Cyclotron Facility. UCNs are neutrons with energies below 3×10^{-7} eV. They can be used to make extremely accurate measurements of the electric dipole moment of the neutron to test time reversal symmetry. LENS has successfully produced cold neutrons and we are designing an extension to study UCN production. I have modeled a UCN module which will test a novel technique involving magnon interactions in solid oxygen to produce UCNs. Our module slows down the fast neutrons produced by a (p,n) reaction in Be target with a polyethylene cold neutron moderator and directs the resulting cold neutrons into a half liter piece of solid oxygen with water and polyethylene as reflectors. Cold neutrons enter into solid oxygen and are down-scattered to the UCN energy range. These UCNs are then directed upwards toward a storage bottle at a higher elevation, being further slowed down by gravity. I have tested various design configurations trying to maximize the cold neutron flux through the solid oxygen component while minimizing the heat load in the cryogenic system. The simulations predict a cold neutron flux of 2×10^{10} $n/cm^2/s$ with a heat load around 1 W from 2.5 mA of 13 MeV protons. My findings are being used as a guideline to design our module.

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