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Liquid Deuterium Thermosyphon for an Ultracold Neutron Source[1] KIERA AUGUSTO, University of Winnipeg, TUCAN COLLABORATION — The TUCAN (TRIUMF Ultracold Advanced Neutron) EDM experiment seeks to measure the neutron electric dipole moment (EDM) with an uncertainty $\delta d_n = 10^{-27}$ $e$cm. A new spallation-driven He-II ultracold neutron (UCN) source is developed at TRIUMF so that the goal statistical uncertainty can be reached. In the final layer of neutron moderation prior to UCN production, a liquid deuterium (LD_2) volume surrounds the He-II to efficiently moderate hotter spallation neutrons to the desired CN energies. The LD_2 moderator experiences a heat load of 60 W for the design proton beam current of 40 μA, and is cooled to 20 K using a distant cryocooler at higher elevation. This poster describes studies of the engineering design and performance of a natural circulation system (thermosyphon) used to provide cooling to the LD_2 volume near the hot spallation target. The thermosyphon features no moving parts and single-phase (liquid) operation. A key discovery made through these studies is that the thermosyphon will continue to flow despite the duty cycle from proton beam pulsing at minute-long timescales.

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