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**A Lithium Vapor Box similarity experiment employing water vapor**[1] JA SCHWARTZ, C JAGOE, Princeton University, RJ GOLDSTON, MA JAWORSKI, Princeton Plasma Physics Laboratory — Handling high power loads and heat flux in the divertor is a major challenge for fusion power plants. A detached plasma will likely be required. However, hydrogenic and impurity puffing experiments show that detached operation leads easily to X-point MARFEs, impure plasmas, degradation in confinement, and lower helium pressure at the exhaust. The concept of the Lithium Vapor Box Divertor is to use local evaporation and strong differential pumping through condensation to localize the gas-phase material that absorbs the plasma heat flux, and so avoid those difficulties. In order to design such a box first the vapor without plasma must be simulated. The density of vapor required can be estimated using the SOL power, major radius, poloidal box length, and cooling energy per lithium atom. For an NSTX-U-sized machine, the Knudsen number Kn spans $\sim$ 0.01 to 1, the transitional flow regime. This regime cannot handled by fluid codes or collisionless Monte Carlo codes, but can be handled by Direct Simulation Monte Carlo (DSMC) codes. To validate a DSMC model, we plan to build a vapor box test stand employing more-convenient water vapor instead of lithium vapor as the working fluid. Transport of vapor between the chambers at $\sim$-50C will be measured and compared to the model.

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Jacob Schwartz
Princeton University

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