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Particle Simulations of Knudsen Layer Effects on DT Fusion* BRUCE COHEN, ANDRIS DIMITS, GEORGE ZIMMERMAN, SCOTT WILKS, Lawrence Livermore National Laboratory — Kinetic effects have been shown to degrade fusion reactivities near an absorbing bounding surface in some circumstances, the so-called Knudsen layer (KL) effect. There is renewed interest in the KL effect [1] in the context of inertial fusion [2]. We report particle simulations (1D Cartesian in space, 3D in velocity) of the transport of deuterium and tritium (DT) plasma in a system with a partially absorbing boundary and including Coulomb collisions and the effects of non-Maxwellian velocity distribution functions on fusion reactivity. Ion-ion Coulomb collisions are implemented with a pairwise scheme that conserves number, momentum, and energy. The influences of the albedo and temperature of the boundary, ion slowing on electrons, ambi-polar electric fields, fusion alphas, and a Cu minority species are studied. Reductions in fusion reactivity are quantified. For DT at 9 keV, the Gamow peak in the fusion reactivity is at 29 keV; but the KL decrements in the ion tail from Maxwellian are observed to occur at higher energies so that the Maxwellian-averaged formula for the fusion reactivity using the space-time local temperatures and densities gives a good fit to the kinetic fusion rate. Kinetic effects are nevertheless important in determining end losses, velocity tail decrements and anisotropy, and ion axial plasma profiles for density, kinetic energy, fluxes, and flows. [1] D. B. Henderson, Phys. Rev. Lett. 33, 1142 (1974). [2] K. Molvig, et al., Phys. Rev. Lett. 109, 095001 (2012). *Work performed for the USDOE under contract DE-AC52-07NA27344 at Lawrence Livermore Nat. Lab.

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