Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Transport Regimes Spanning Magnetization-Coupling Phase Space[1] SCOTT D. BAALRUD, SANAT TIWARI, Univ of Iowa, JEROME DALIGAULT, Los Alamos National Laboratory — The manner in which transport properties vary over the entire parameter-space of coupling and magnetization strength is explored. Four regimes are identified based on the relative size of the gyroradius compared to other fundamental length scales: the collision mean free path, Debye length, distance of closest approach and interparticle spacing. Molecular dynamics simulations of self-diffusion and temperature anisotropy relaxation spanning the parameter space are found to agree well with the predicted boundaries. Comparison with existing theories reveals regimes where they succeed, where they fail, and where no theory has yet been developed. The results suggest that magnetic fields may be used to assist ultracold neutral plasma experiments to reach regimes of stronger electron coupling by reducing heating of electrons in the direction perpendicular to the magnetic field.. By constraining electron motion along the direction of the magnetic field, the overall electron temperature is reduced nearly by a factor of three. A large temperature anisotropy develops as a result, which can be maintained for a long time in the regime of high electron magnetization.

[1]Work supported by LDRD project 20150520ER at LANL, AFOSR FA9550-16-1-0221 andUS DOE Award DE-SC00161

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Date submitted: 12 Jul 2017 Electronic form version 1.4