Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Transport Theory for Plasmas that are Strongly Magnetized and Strongly Coupled[1] SCOTT BAALRUD, Univ of Iowa, JEROME DALIGAULT, Los Alamos National Laboratory — Plasmas with components that are magnetized, strongly coupled, or both arise in a variety of frontier plasma physics experiments including magnetized dusty plasmas, nonneutral plasmas, magnetized ICF concepts, as well as from self-generated fields in ICF. Here, a species is considered strongly magnetized if the gyroradius is smaller than the spatial scale over which Coulomb interactions occur. A theory for transport properties is described that treats a wide range of both coupling and magnetization strengths. The approach is based on an extension of the recent effective potential transport theory [1] to include a strong magnetic field. The underlying kinetic theory is based on an extension of the Boltzmann equation to include a strong magnetic field in the dynamics of binary scattering events. Corresponding magnetohydrodynamic equations are derived by solving the kinetic equation using a Chapman-Enskog like spectral method. Results are compared with classical molecular dynamics simulations of self-diffusion of the one component plasmas [2], and with simulations of parallel to perpendicular temperature equilibration of an initially anisotropic distribution. [1] S.D. Baalrud, and J. Daligault, PRL 110, 235001 (2013). [2] T. Ott and M. Bonitz, PRL 107, 135003 (2011).

[1]This material is based upon work supported by AFOSR award FA9550-16-1-0221 and DOE OFES award DE-SC0016159.

Scott Baalrud
Univ of Iowa

Date submitted: 13 Jul 2016 Electronic form version 1.4