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Transport Phenomena in Magnetized Plasmas across Coupling Regimes[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, magnetized ICF concepts, as well as from self-generated fields in ICF. Here, a theory is described that treats classical mixtures of magnetized and unmagnetized species across coupling regimes. The approach is based on an extension of the recent effective potential transport theory [1] to include a magnetic field. The utility of this approach is that it can be incorporated into magnetohydrodynamic descriptions by modification of the Coulomb logarithm in the transport coefficients. Like weakly coupled plasma theory, the magnetic field is found to suppress cross-field transport. However, the ratio of parallel to cross field transport rates is much closer to unity at strong coupling. Not only cross field, but also parallel, transport rates are found to be reduced by the field. Results are compared with classical molecular dynamics simulations of self-diffusion of the one component plasma [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).

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