Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Diffusion of Strongly Magnetized One-Component Plasma.[1]
KEITH VIDAL, SCOTT BAALRUD, University of Iowa, JEROME DALIGAULT, Los Alamos National Laboratory — Charged particles in ultracold neutral plasmas or in non-neutral plasmas experiments with a strong magnetic field can have a gyroradius smaller than the Debye length but larger than the distance of closest approach. Particles with such characteristics are referred to as strongly magnetized. The transport properties of charged particles at these conditions have not been well described. Recent molecular dynamics (MD) simulations appear to observe Bohm scaling ($1/B$) of the diffusion coefficient perpendicular to the magnetic field when the plasma is strongly magnetized [1]. Here we extend the previous work to weaker coupling by calculating the perpendicular, parallel, and transverse diffusion coefficients from MD simulations of the one-component plasma in the strongly magnetized, weakly coupled regime ($\Gamma \approx 0.01$). The MD diffusion results show the perpendicular and parallel diffusion coefficients scaling with magnetic field strength do not agree with the traditional Braginskii transport theory or other leading theories. A new transport theory is needed to address these conditions. Also discussed are the requirements for the time step, simulation duration, and the number of particles needed for accurate MD simulations. [1] S.D.B. and J.D., Phys. Rev. E 96, 043202 (2017).

[1]This work was supported by the Air Force Office of Scientific Research under Award No. FA9550-16-1-0221.

Keith Vidal
University of Iowa

Date submitted: 28 Jun 2019 Electronic form version 1.4