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Effects of Coulomb Coupling on the Stopping Power of Plasmas[1]
DAVID BERNSTEIN, University of Iowa, JEROME DALIGAULT, Los Alamos National Laboratory, SCOTT BAALRUD, University of Iowa — Stopping power of charged particles in plasma is important for a detailed understanding of particle and energy transport in plasmas, such as those found in fusion applications. Although stopping power is rather well understood for weakly coupled plasmas, this is less the case for strongly coupled plasmas. In order to shed light on the effects of strong Coulomb coupling, we have conducted detailed molecular dynamics simulations of the stopping power of a One-Component Plasma (OCP) across a wide range of conditions. The OCP allows first-principle computations that are not possible with more complex models, enabling rigorous tests of analytical theories. The molecular dynamics simulations were compared to two analytical theories that attempt to extend traditional weakly-coupled theories into the strong coupling regime. The first is based on the binary approximation, which accounts for strong coupling via an effective scattering cross section derived from the effective potential theory. The second is based on the dielectric function formulation with the inclusion of a local field corrections.

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