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A Model for Electron-Ion Transport in Dense Plasmas Based on a Mean Force Uehling-Uhlenbeck Kinetic Equation SHANE RIGHTLEY, SCOTT BAALRUD, University of Iowa — Dense plasmas can be subject to electron degeneracy, strong Coulomb coupling, and varying degrees of partial ionization, which makes them difficult to model. We present a method for predicting dense plasma transport using the quantum Boltzmann equation of Uehling and Uhlenbeck, in which the scattering potential is the potential of mean force which is determined by the equilibrium state of the plasma. The dynamics are therefore reduced to those of a binary collision, whereas the potential of mean force can be calculated by any suitable equilibrium method. The method is thus faster than fully dynamical simulations while still containing much of the relevant physics. We apply the method to the calculation of electrical conductivity in dense plasmas; specifically compressed hydrogen and solid density aluminum, each over a range of temperatures spanning above and below the Fermi temperature. Results are compared to alternative models in addition to quantum molecular dynamics simulations in order to validate the model. This work was supported by the U.S. Department of Energy, Office of Fusion Energy Sciences under Award Number DE-SC0016159.

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