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Radiation in Particle Simulations of Hot Dense Matter FRANK GRAZIANI, RICHARD MORE, Lawrence Livermore National Laboratory — The variety of complex processes that take place in hot dense radiative plasmas where temperatures are in excess of several keV and densities are higher than metals, has forced computational physicists in ICF and astrophysics to make a number of assumptions regarding how to model non-equilibrium plasmas undergoing thermal relaxation. In order to make the simulations feasible, variations on the Landau-Spitzer model are frequently invoked. There has been recent work on the theoretical properties of thermal relaxation in such plasmas, but there is controversy due to the various approximations needed to make the calculations tractable. Experimental validations in the regimes of interest are prohibitive. Direct Numerical Simulation (DNS) of the many-body interactions of plasmas is a promising approach to model validation but unfortunately, previous work either relies on the collisionless approximation or radiation is entirely absent. We present a new numerical simulation capability that will address a currently unsolved problem: the extension of molecular dynamics to collisional plasmas where Brehmstrahlung and Compton scattering are present. This new tool provides a method for assessing the accuracy of energy and momentum exchange models in hot dense plasmas.

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