Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

An Analytic Screening Potential for Dense, Strongly-Coupled Plasmas[1] LIAM STANTON, LLNL, MICHAEL MURILLO, LANL, FRANK GRAZIANI, LLNL — Characterizing warm dense matter (WDM) has gained renewed interest due to advances in powerful lasers and next generation light sources. Because WDM is strongly coupled and moderately degenerate, we must often rely on simulations of WDM, which are necessarily based on molecular dynamics of ions interacting through a screened potential. Almost always, a Debye- (Yukawa-) like interaction is assumed; however, it is well known that such long wavelength models over-screen. Here, we present a new effective ion-ion interaction, which recovers the exact fermionic linear response in the long-wave limit while retaining a pair-potential functionally similar to that of the Yukawa form. This new potential not only improves the accuracy of screening effects without contributing to the computational complexity of the model, but it also adds physics entirely missing from Yukawa models (such as the onset of Friedel oscillations). Simulations of the ion structure factor are compared to XRTS data for Be and C in the WDM regime.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS-490714

Liam Stanton
LLNL

Date submitted: 11 Nov 2011 Electronic form version 1.4