Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Collisions and Correlation Effects in Warm Dense Matter[1]
THOMAS HENTSCHEL, Cornell University, ATTILA CANGI, Center for Advanced Systems Understanding, Helmholtz-Zentrum Dressen-Rossendorf, ANDREW BACZEWSKI, Center for Computing Research, Sandia National Laboratories, STEPHANIE HANSEN, Pulsed Power Sciences Center, Sandia National Laboratories — The dielectric function calculated within the Random Phase Approximation (RPA) has been applied in many studies to determine the response properties of plasmas, like dynamic structure factors and stopping powers. However, the RPA does not take into account short range electron-electron and electron-ion interactions which can be important in the warm dense matter regime. To go beyond the RPA, we modify the dielectric function by incorporating electron-ion collisions and electronic correlations. The collisions are calculated self-consistently using an average-atom model, while the correlations come from the static local field correction of the uniform electron gas, which was computed by using a path integral Monte Carlo based neural network [Dornheim et al., J. Chem. Phys. 151, 194104 (2019)]. We show how the modified dielectric function changes both dynamic structure factors and stopping powers for charged particles traveling through a plasma and compare with results from experimental data and other theoretical models.

[1]Research supported by the NNSA Stewardship Science Academic Programs under DOE Cooperative Agreement DE-NA0003764.

Thomas Hentschel
Cornell University

Date submitted: 28 Jun 2020 Electronic form version 1.4