SHOCK13-2013-000382

Abstract for an Invited Paper for the SHOCK13 Meeting of the American Physical Society

Structure Measurements of Highly Compressed Aluminum using X-Ray Thomson Scattering TAMMY MA, Lawrence Livermore National Laboratory

X-ray Thomson scattering (XRTS) is a powerful technique to characterize materials in the challenging warm dense matter regime. In addition, XRTS measurements enable the benchmarking of dense plasma models and provide validation for EOS. Spectrally, angularly, and temporally resolved XRTS has been used to probe highly compressed aluminum (3x solid density) with 18 keV x-rays. The measured elastic scattering feature shows a well-pronounced correlation characteristic of the warm dense matter state. For the first time, the measurements of the scattering are precise enough to distinguish between theoretical models for the ion structure and show that screening effects must be accounted for in order to fit the shape and absolute intensity of the data. This further demonstrates the capability of XRTS to resolve the ion-ion correlation for an accurate measurement of compression. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.