Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Toward Sodium X-Ray Diffraction in the High-Pressure Regime
X. GONG, D.N. POLSIN, J.R. RYGG, T.R. BOEHLY, L. CRANDALL, B.J. HENDERSON, S.X. HU, M. HUFF, R. SAHA, G.W. COLLINS, Laboratory for Laser Energetics, U. of Rochester, R. SMITH, J. EGGERT, A.E. LAZICKI, LLNL, M. MCMAHON, Dept. of Physics, U. of Edinburgh — We are working to quasi-isentropically compress sodium into the terapascal regime to test theoretical predictions that sodium transforms to an electride.[1, 2] A series of hydrodynamic simulations have been performed to design experiments to investigate the structure and optical properties of sodium at pressures up to 500 GPa. We show preliminary results where sodium samples, sandwiched between diamond plates and lithium-fluoride windows, are ramp compressed by a gradual increase in the drive-laser intensity. The low sound speed in sodium makes it particularly susceptible to forming a shock; therefore, it is difficult to compress without melting the sample. Powder x-ray diffraction[3] is used to provide information on the structure of sodium at these high pressures. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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[3]J. R. Rygg *et al.*, Rev. Sci. Instrum. **83**, 113904 (2012).

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Date submitted: 18 Jul 2017 Electronic form version 1.4