Abstract Submitted
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Invariance of the Dissipative Action at Ultrahigh Strain Rates above the Strong Shock Threshold[1] JONATHAN CROWHURST, MICHAEL ARMSTRONG, KIMBERLY KNIGHT, JOSEPH ZAUG, ELAINE BEHYMER, Lawrence Livermore National Laboratory — We have directly resolved shock structures in pure aluminum in the first few hundred picoseconds subsequent to a dynamic load, at peak stresses up to 43 GPa and strain rates of in excess of 10^{10} s^{-1}. For strong shocks we obtain peak stresses, strain rates, and rise times. From these data, we directly validate[1] the invariance[2] of the dissipative action in the strong shock regime, and by comparing with data obtained at much lower strain rates show that this invariance is observed over at least 5 orders of magnitude in the strain rate. Over the same range, we similarly validate the fourth-power scaling of strain rate with peak stress (the Swegle-Grady relation). 1. J. C. Crowhurst, M. R. Armstrong, K. B. Knight, J. M. Zaug, E. M. Behymer, Phys. Rev. Lett, 107, 144302 (2011). 2. D. E. Grady, J. Appl. Phys. 107, 013506 (2010). This work was also supported by the EFree, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Grant No. DESC0001057.

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