Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Two-Dimensional Imaging Velocimetry of Heterogeneous Flow and Brittle Failure in Diamond SUZANNE ALI, Univ of California - Berkeley, RAYMOND SMITH, DAVID ERSKINE, JON EGGERT, PETER CELLIERS, GILBERT COLLINS, Lawrence Livermore National Lab, RAYMOND JEANLOZ, Univ of California - Berkeley — Understanding the nature and dynamics of heterogeneous flow in diamond subjected to shock compression is important for many fields of research, from inertial confinement fusion to the study of carbon rich planets. Waves propagating through a shocked material can be significantly altered by the various deformation mechanisms present in shocked materials. Quantifying the spatial and temporal effects of these deformation mechanisms has been limited by a lack of diagnostics capable of obtaining simultaneous micron resolution spatial measurements and nanosecond resolution time measurements. We have utilized the 2D Janus High Resolution Velocimeter at LLNL to study the time and space dependence of fracture in shock-compressed diamond above the Hugoniot elastic limit. We have imaged the development and evolution of elastic-wave propagation, plastic-wave propagation, and fracture networks in the three primary orientations of single-crystal diamond, as well as in microcrystalline and nanocrystalline diamond, and find that the deformation behavior depends sensitively on the orientation and crystallinity of the diamonds.

Suzanne Ali
Univ of California - Berkeley

Date submitted: 30 Jan 2015 Electronic form version 1.4