Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Interferometric analysis of cylindrically focused laser-driven shock waves in a thin liquid layer ALEX MAZNEV, DAVID VEYSSET, GAGAN SAINI, STEVE KOOI, THOMAS PEZERIL, KEITH NELSON, MIT — Spherically and cylindrically focused shock waves are of great interest for studying fundamental aspects of behavior of materials under extreme conditions. Traditionally, converging shock waves have been studied on the spatial scale of 1 m using facilities such as implosion chambers. In this work, we apply time-resolved interferometric imaging to studying laser-driven shock waves on the microscale. Shock waves are generated in a 5 μm-thick layer of water by sub-nanosecond laser pulses focused into a ring of 100 um radius. Imaging is performed with a Mach-Zehnder interferometer by time-delayed femtosecond pulses. We obtain a series of images tracing the converging shock wave as it collapses in the focal point and then reemerges as a divergent shock wave leaving behind a cavitation bubble at the focus. Quantitative analysis of interferograms yields density and shock velocity values that match the water Hugoniot data found in the literature. The results open the prospect of spatially resolved studies of shock-compressed materials in a small-scale all-optical experiment.

David Veysset
MIT

Date submitted: 18 Feb 2011 Electronic form version 1.4