Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Shock driven melting and resolidification upon release in cerium CINDY BOLME, CURT BRONKHORST, DON BROWN, FRANK CHERNE, JASON COOLEY, MICHAEL FURLANETTO, ARIANNA GLEASON, BRIAN JENSEN, CHARLES OWENS, Los Alamos National Laboratory, SUZANNE ALI, DAYNE FRATANDUONO, Lawrence Livermore National Laboratory, ERIC GALTIER, EDUARDO GRANADOS, HAE JA LEE, BOB NAGLER, SLAC National Accelerator Laboratory — The temperature rise due to increasing entropy during shock compression and the corresponding temperature decrease due to isentropic expansion upon release cause the physics of melting and solidification under dynamic pressure changes to differ fundamentally from the more common liquid-solid transitions governed by thermal diffusion. We investigated laser shock driven melting and resolidification during release in cerium to examine the dynamics of these processes. Cerium was selected as the material of study due to the low pressure at which γ-cerium melts along the principle Hugoniot and due to cerium's anomalous melt boundary at low pressure, which facilitates its transition from liquid to solid during isentropic release. The structural phase of cerium was probed with X-ray diffraction using the LCLS X-ray free electron laser, which provided *in situ* measurements of the transition dynamics. The experimental results will be presented showing the resolidification occurring over 10s of ns.

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Date submitted: 24 Feb 2017 Electronic form version 1.4