Abstract Submitted
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Time-resolved x-ray imaging of void collapse at 10 micron length scales[1] MICHAEL ARMSTRONG, RYAN AUSTIN, ERIC BUKOVSKY, Lawrence Livermore Natl Lab, PAUL CHOW, Argonne National Laboratory, PAULIUS GRIVICKAS, JOSHUA HAMMONS, BATIKAN KOROGLU, ANDREW ROBINSON, WILLIAM SHAW, TREVOR WILLEY, Lawrence Livermore Natl Lab, YUMING XIAO, Argonne National Laboratory — Pulsed x-ray imaging can provide substantial insight into a wide range of initiation-related phenomena, particularly the in situ imaging of dynamically compressed voids, which are thought to play a fundamental role in explosive initiation. Current models of the dynamic compression behavior of inhomogeneous materials are empirically calibrated to bulk, aggregate experimental data. The development of more fundamental models depends on detailed measurements and corresponding simulations which resolve single void collapse events. Further, since material strength depends on scale, experiments at the scale of actual voids (<10 μm) are preferred. Since the field of view for these experiments is relatively small (˜100s μm) and void collapse occurs at low pressure, these experiments can be performed with a small scale (100 mJ) laser in a portable experimental setup. Here we present the results of x-ray imaging experiments at the Advanced Photon Source on voids embedded in TNT and silicon using both explosive and laser-driven shocks, which approach the spatial scale of void collapse in actual explosives, 1-10 μm.

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