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Multi-Frame Imaging of Shock Propagation LEORA COOPER, DAVID VEYSSET, BRANDT PEIN, ALEXEI MAZNEV, Massachusetts Institute of Technology, Inst of Soldier Nanotechnologies, STEVEN KOOI, Institute for Soldier Nanotechnologies, KEITH NELSON, Massachusetts Institute of Technology —
We have developed a platform to generate and image shock propagation through quasi-2D materials. A thin material (5-50 μm) is pressed between two glass plates, confining it in one dimension. A sub-nanosecond laser pulses is focused into a ring of 100 μm radius, launching a shock wave that propagates and focuses towards the circle's center. The high pressure of the shock wave causes changes in the refractive index of the material that can be observed with Shlieren imaging using a train of femtosecond pulses. A Fabry-Perot cavity is used to generate a train of imaging pulses spaced 5 ns apart. Using a high-speed multi-frame camera we have been able to take up to sixteen frames with 5 ns intervals of the same shock wave. This single-shot imaging method allows us to investigate irreversible processes in materials including phase transitions, cracking and decomposition in energetic materials, and cavitation and crack formation in water following the shock front.

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