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Experimental study of shock-driven cavity collapse with a single-stage gas gun driver PHILLIP ANDERSON, MATTHEW BETNEY, University of Oxford, HUGO DOYLE, NICHOLAS HAWKER, First Light Fusion Ltd., RONALD ROY, University of Oxford — This paper explores experimental studies of shock-driven cavity collapse using a single-stage gas gun. Shocks of up to 1 GPa are generated in a hydrogel with the impact of a planar-faced projectile (50 mm dia.). Within the hydrogel, a pre-formed cavity (5 mm dia.) is cast, which is collapsed by the interaction with the shockwave. The basic collapse process involves the formation of a high-speed transverse jet and then a second collapse phase driven from jet impact. Single-shot multi-frame schlieren imaging is used to show the position and timing of optical emission in relation to the collapse hydrodynamics. Further, temporally and spectrally-resolved measurements of the optical emission are made through simultaneous use of multiple band-passed PMTs and an integrating spectrometer. This reveals three distinct pulses of emission possessing different frequency content. The first corresponds to the trapping of gas during jet impact; the second and third correspond to the further inertial collapse of the now toroidal cavity. Plasma models are used to provide the first indication of the temperature of these inertially confined plasmas.

Nicholas Hawker
First Light Fusion Ltd.

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