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Experimental and numerical study of shock-driven collapse of multiple cavity arrays MATTHEW BETNEY, PHILLIP ANDERSON, University of Oxford, BRETT TULLY, HUGO DOYLE, NICHOLAS HAWKER, First Light Fusion Ltd., YIANNIS VENTIKOS, University College London — This study presents a numerical and experimental investigation of the interaction of a single shock wave with multiple air-filled spherical cavities. The 5 mm diameter cavities are cast in a hydrogel, and collapsed by a shock wave generated by the impact of a projectile fired from a single-stage light-gas gun. Incident shock pressures of up to 1 GPa have been measured, and the results compared to simulations conducted using a front-tracking approach. The authors have previously studied the collapse dynamics of a single cavity. An important process is the formation of a high-speed transverse jet, which impacts the leeward cavity wall and produces a shockwave. The speed of this shock has been measured using schlieren imaging, and the density has been measured with a fibre optic probe. This confirmed the computational prediction that the produced shock is of a higher pressure than the original incident shock. When employing multiple cavity arrays, the strong shock produced by the collapse of one cavity can substantially affect the collapse of further cavities. With control over cavity placement, these effects may be utilised to intensify collapse. This intensification is experimentally measured via analysis of the optical emission.

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