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Numerical study of shock-driven cavity collapse using the front tracking method BRETT TULLY, NICHOLAS HAWKER, First Light Fusion Ltd, MATTHEW BETNEY, University of Oxford, YIANNIS VENTIKOS, University College London — The front tracking method, including a tabular equation of state framework, has been previously used by the authors to numerically study the conditions generated during shock-driven cavity collapse. The dominant dynamics involve the formation of a high-speed transverse jet and the subsequent impact of this jet on the leeward bubble wall. The process of jet formation can be interpreted via the same driving mechanism as Richtmyer-Meshkov instability; the reflection of the shockwave causes a focusing of the flow. During impact a small amount of the gas in the cavity is trapped against the leeward wall and is strongly compressed and heated. This jet impact also produces a strong point source shockwave which propagates outwards, further collapsing the now toroidal cavity. The termination of the collapse of the torus corresponds to minimum volume. There are thus two key moments during the collapse where the cavity contents form an inertially confined plasma: first jet impact and second toroidal minimum volume. The present paper elucidates these dynamics with numerical simulations and demonstrates a preliminary comparison to experiments. Basic metrics such as the first phase collapse time are compared, with good agreement.

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