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Experimental and numerical investigation of cylindrical and hemispherical jet formation MATTHEW BETNEY, PETA FOSTER, TIM RINGROSE, THOMAS EDWARDS, BRETT TULLY, HUGO DOYLE, NICHOLAS HAWKER, First Light Fusion Ltd., FIRST LIGHT FUSION LTD. TEAM — This paper presents a detailed investigation of the formation of jets in cylindrical and spherical cavities, when impacted by shocks at extreme pressures. As the shock pressure increases the effects of material strength lessen in proportion. Beyond a certain magnitude the behaviour is referred to as hydrodynamic. In this domain both cylindrical and spherical cavities involute to form jets, which go on to strike the leeward cavity wall, compressing the cavity contents to high pressures and temperatures. In this study, the jet formation process is isolated by cutting hemispherical and half-cylindrical cavities from the rear side of PMMA and copper blocks. This allows direct measurement of the jet speed and shape using high speed imaging, providing data against which numerical models may be compared. Shock waves at pressures of up to 30 GPa are formed in the targets by the impact of projectiles from a two-stage light gas gun, at velocities of up to 7 km/s. Numerically, the jet formation process is modelled using our in-house front-tracking code. This code uses Lagrangian hypersurfaces to model the interfaces between different media, with an underlying Eulerian mesh used to model the bulk flow. Detailed comparisons between numerical and experimental results are presented.

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