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Cylindrically Convergent Implosions of Metal Liners for Driving an Isentropic Compression in Cryogenic Deuterium[1] MARCUS WEINWURM, SIMON BLAND, JEREMY CHITTENDEN, Imperial College London —
In order to take advantage of geometrical convergence, we investigated a method, where a Beryllium liner drives a cylindrical shockless compression in a cryogenic Deuterium fill. The metal liner acts as a current carrier as well as a pressure boundary to the fill. The required driving pressure was obtained through a fictitious flow (FF) simulation [Clark, D.S. and Tabak, M. (2007) Nuclear Fusion 47, 1147]. A current model, which can recreate the FF compression inside the liner by shaping the current pulse, is then introduced. This method allows efficient compression of Deuterium at low entropy, enabling the recreation of conditions present in the interior of gas giants and potentially the observation of a transition into a metallic state. Two-dimensional simulations show that thick liners remain robust to the growth of Rayleigh-Taylor instabilities, suggesting that cylindrical isentropic ramp compression is a promising scheme for extending Deuterium's experimentally measured Equation of State.

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