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Direct measurement of the confinement time in a magnetically driven liner stagnation

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We report on direct, radiographic measurement of the stagnation phase of a magnetically driven liner implosion. In experiments on the Z machine, a beryllium liner is filled with liquid deuterium and imploded to a minimum radius of 440 microns (radial convergence ratio of 7.7) over 300ns, achieving a density at stagnation of approximately 10 g/cc. The measured confinement time is 12.2 ns, compared to 14 ns from 1D simulations. Comparison of the evolution of the density profiles from the radiographs with the simulation shows a deviation in the reflected shock trajectory and the stagnation of the trailing mass. Additionally, the magneto-Raleigh-Taylor instability modifies the axial liner mass distribution, leading to enhanced compression with shorter confinement in the bubble region compared to the spikes, reducing the overall pressure-confinement time product by 29 percent as compared to the 1D simulation. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U. S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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