Abstract Submitted
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Metal Liner Implosions for Cylindrical Convergent Isentropic Compression of Deuterium and its Application to MAGLIF MARCUS WEINWURM, BRIAN APPELBE, JONATHAN SKIDMORE, SIMON BLAND, JEREMY CHITTENDEN, Imperial College — Isentropic Compression Experiments on pulsed power machines in the field of High Energy Density Physics have gained interest in recent years. We describe a method of isentropically compressing cryogenic Deuterium inside a metal liner. Pulse shaping was performed by solving Kidder's homogeneous isentropic compression for cylindrical geometry and extending it to an arbitrary Equation of State. The obtained pulse shape enables us to simulate a cylindrically convergent ramp wave, which quasi-isentropically compresses the Deuterium fill to densities much higher than achievable by using a standard pulse. The effect of Rayleigh-Taylor instabilities upon the peak density achieved is evaluated using the resistive magneto-hydrodynamics code Gorgon for a maximum current of 25 MA. Therefore, isentropic liner implosions are a promising technique for recreating the conditions present in the interiors of gas giants. We applied this technique to the High-Gain Magnetized Liner Inertial Fusion (MAGLIF) scheme [1]. There a metal liner is filled with DT gas surrounded by a layer of DT ice. We show how the current pulse can be shaped in order to isentropically compress the DT ice layer. By doing so, we keep the fuel at low temperature. This maximises the compression of the DT ice layer, and increases rho-r at stagnation. Burn wave propagation in the isentropically compressed fuel is compared to propagation in fuel compressed by a standard current pulse.

[1] S.A. Slutz and R. A. Vesey, Phys. Rev. Lett. 108, 025003 (2012)

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