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Publication Date

2008-02-17

HIFAN 1585a

HEAVY-ION DIRECT-DRIVE T-LEAN TARGETS FOR SELF-T BREEDING AND PLASMA MHD DIRECT CONVERSION

by

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November 2007

This work was supported by the Director, Office of Science, Office of Fusion Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Abstract: NP8.00049:

Heavy-ion direct-drive T-lean targets for self-T breeding and plasma MHD direct conversion

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Transverse and longitudinal beam compression in neutralizing plasma enable heavy ion beam direct drive in the ablative rocket regime at high rocket efficiency with ion ranges a fraction of the initial ablator thickness for low adiabat implosions. Ions can couple energy into thick fuel capsule ablators at the peak in rocket efficiency as efficiently as x-rays do in hohlraums, but without conversion loss of beam energy into x-rays. High ablation velocities with heavy ion direct drive mitigate hydrodynamic instabilities like x-ray drive. An analytic implosion model with a heavy-ion dE/dx deposition model, together with hydrodynamic implosion calculations (LASNEX and HYDRA) explore beam requirements for heavy ion direct drive for small 1 MJ drive DT targets and larger Tritium-lean ($>$ 90{\%} DD) targets. Both model and implosion codes indicate ion beams can couple $>$15{\%} of their incident energy into compressed fuel assemblies. Increasing ion energy during the drive pulse can reduce the parasitic beam losses on ablated plasma.