Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Magnetized Directly-Driven ICF Capsules: Increased Instability Growth from Non-Uniform Laser Drive[1] CHRIS WALSH, Lawrence Livermore National Laboratory, AIDAN CRILLY, Imperial College London, JOHN MOODY, HONG SIO, Lawrence Livermore National Laboratory, JEREMY CHITTENDEN, Imperial College London — Magnetization of ICF implosions is a pathway to increasing fusion yields by reducing thermal hot-spot losses [1,2]. However, simulations presented here indicate that high-gain spherical direct-drive implosions require greater constraints on the laser heating uniformity when magnetized. At the capsule pole, where the magnetic field is normal to the ablator surface, the field remains in the conduction zone and suppresses non-radial thermal conduction; in unmagnetized implosions this non-radial heat-flow is crucial in mitigating laser heating imbalances. Single-mode simulations show the magnetic field particularly amplifying short wavelength perturbations, whose behavior is dominated by thermal conduction. The most unstable wavelength can also become shorter. 3D multi-mode simulations of the capsule pole reinforce these findings, with increased perturbation growth anticipated across a wide range of scales. Potential experiments to verify these results will be proposed, including a magnetic field applied normal to an ablating foil. [1] – Chang et al, Physical Review Letters 107 035006 (2011) [2] – Walsh et al, Physics of Plasmas 26 022701 (2019)

[1]This work was performed under the auspices of the U.S. Department of Energy by LLNL under the LDRD project SI-2020-002.

Chris Walsh
Lawrence Livermore National Laboratory

Date submitted: 23 Jun 2020 Electronic form version 1.4