Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Quantifying the Effects of Scale and Illumination Geometry in Laser Direct Drive[1] C.A. THOMAS, D. CAO, W. THEOBALD, R. BETTI, K.A. ANDERSON, K.A. BAUER, E.M. CAMPBELL, A.R. CHRISTOPHERSON, T.J.B. COLLINS, R.S. CRAXTON, D.H. EDGELL, R. EPSTEIN, C.J. FORREST, V.YU. GLEBOV, V. GOPALASWAMY, I.V. IGUMENSHCHEV, S.T. IVANCIC, D.W. JACOBS-PERKINS, R.T. JANEZIC, T. JOSHI, J.P. KNAUER, J. KWIATKOWSKI, A. LEES, O.M. MANNION, F.J. MARSHALL, University of Rochester, LLE TEAM — The application of laser direct drive (LDD) research to ignition on the OMEGA laser depends on the degree to which implosions can be scaled in size (and energy) and use different beam geometries. In this talk we present an analysis of cryogenic experiments at two hydrodynamic scales ($S = 0.8$ and 1.0) [Ref. [2]] and find that yield increases as S^4 or faster after correcting for shot-to-shot sources of asymmetry (e.g., the laser pointing). These data also indicate a potential benefit in areal density (in excess of expectations) as targets become larger/thicker. This behavior could be due to changes in preheat or instability/mix (e.g., the capsule stalk) and will be discussed. We are also planning experiments that will quantify performance versus $\eta = R_{\rm b}/R_{\rm t}$, which is the ratio of the laser beam to target radius. The goal is to change the amplitude of the applied mode 10, which has been found to correlate with yield as η^2 to η^3 (Ref. [3]). Lastly, we will connect this work to studies comparing spherical direct drive and polar direct drive,[4,5] and consider implications to LDD research on OMEGA and the National Ignition Facility.

[1]This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.
[2]V. Gopalaswamy *et al.*, Nature **565**, 581 (2019).
[3]A. Lees, "Understanding the Fusion Yield and All of Its Dependencies Using Statistical Modeling of Experimental Data," to be presented at the 62nd Annual Meeting of the American Physical Society Division of Plasmas Physics, Memphis, TN, 9–13 November 2020.
[4]P. B. Radha *et al.*, "Polar-Drive Cryogenic Implosions on the OMEGA Laser," to be presented at the 62nd Annual Meeting of the American Physical Society Division of Plasmas Physics, Memphis, TN, 9–13 November 2020.
[5]W. Theobald *et al.*, "OMEGA Cryogenic Target Implosions in Polar-Direct-Drive Beam Geometry," to be presented at the 62nd Annual Meeting of the American Physical Society Division of Plasmas Physics, Memphis, TN, 9–13 November 2020.

Cliff Thomas
University of Rochester

Date submitted: 29 Jun 2020 Electronic form version 1.4