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Enhanced Laser-Energy Coupling with Small-Spot Distributed Phase Plates (SG5 650) in OMEGA Cryogenic Implosions W. THEOBALD, D. CAO, R. C. SHAH, R. BETTI, A.R. CHRISTOPHERSON, D.H. EDGELL, C.J. FORREST, V.YU. GLEBOV, V.N. GONCHAROV, V. GOPALASWAMY, I.V. IGUMENSHCHEV, S.T. IVANCIC, J.P. KNAUER, O.M. MANNION, F.J. MARSHALL, Z.L. MOHAMED, D. PATEL, H.G. RINDERKNECHT, M.J. ROSENBERG, C. STOECKL, C. THOMAS, S.P. REGAN, University of Rochester, M. GATU JOHNSON, J.A. FRENJE, R.D. PETRASSO, PSFC, MIT — The ratio of the laser far-field spot diameter to the target diameter has been reduced in an attempt to mitigate cross-beam energy transfer and improve energy coupling. The 60 OMEGA beams were outfitted with new small spot ("SG5-650") distributed phase plates (DPP's), with a diameter ˜80% of that of the standard SG5-850 DPP's, and used for cryogenic DT ice target implosions. The ablation-front trajectory, the backscattered laser energy, and the neutron bang time were found to be consistent with a 10% increase in energy coupling. The hydrodynamic efficiency, defined as the ratio of the kinetic energy in the imploding shell to the laser energy, increased from 4.5% to 5.0%. However, an increase in hot electron production was observed, and evidence was seen in framing-camera images for increased hydrodynamic instabilities associated with the smaller DPP spots, limiting the implosion performance. Further experiments are required to study how to maintain the improved energy coupling while mitigating preheat and hydrodynamic instabilities. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

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