Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Hot Spot and Fuel Imaging Using Nuclear Diagnostics on Direct-Drive Cryogenic Implosions on OMEGA HANS RINDERKNECHT, CHAD FORREST, RAHUL SHAH, WOLFGANG THEOBALD, SEAN REGAN, Laboratory for Laser Energetics, OLIVIER LANDOAS, TONY CAILLAUD, CEA, PETR VOLEGOV, CARL WILDE, VERENA GEPPERT-KLEINRATH, CHRIS DANLY, Los Alamos National Laboratory, RASPBERRY SIMPSON, JOHAN FRENJE, MIT PSFC — Achieving a symmetric implosion and fuel assembly is critical to maximizing hot-spot pressure and nuclear yield in inertial confinement fusion (ICF) implosions. Nuclear diagnostics provide a direct measurement of the hot-spot shape relevant to nuclear performance and an indirect measurement of the fuel morphology via neutron elastic scattering of fuel ions. We present recent advances in neutron and charged-particle imaging of directly driven cryogenic ICF implosions at the Omega Laser Facility. A neutron imaging system with penumbral and annular apertures was used to record neutron images of the hot spot. Charged-particle penumbral and pinhole imaging provides a complementary measurement of the hot spot via forward-scattered (high-energy) deuterons, as well as a new approach to measure the symmetry of the assembled fuel via sidescattered (low-energy) deuterons. Experimental results and plans for further implementation of these diagnostics will be presented. 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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Date submitted: 24 Jun 2019 Electronic form version 1.4