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Knock-on Deuteron Imaging of the Hot Spot and Compressed Fuel in Direct-Drive Cryogenic ICF Implosions[1] HANS RINDERKNECHT, J.P. KNAUER, P.B. RADHA, S.P. REGAN, LLE-UR, J. KUNIMUNE, P. ADRIAN, J.A. FRENJE, M. GATU JOHNSON, F.H. SEGUIN, PSFC-MIT, B. BACHMANN, LLNL — Neutrons from D-T fusion reactions in the hot spot of inertial confinement fusion (ICF) implosions elastically scatter deuterons and tritons as they transit the surrounding dense fuel layer. The energy of these "knock-on" charged particles depends on their angle of scattering and ranges up to 12.5 (10.6) MeV for deuterons (tritons), respectively. The most-energetic particles are forward scattered and indicate the shape of the hot spot, whereas lower-energy particles are made by sidescattering and ranging in the fuel and contain information about the distribution of mass around the hot spot. We report on the design and first results of a knock-on deuteron imager (KoDI) to record spectrally resolved images of these scattered particles from laser-direct-drive cryogenic ICF implosions on the OMEGA laser. The source is imaged using a multi-penumbral aperture with 35magnification. A CR-39 detector provides energy resolution in the resulting images, from which the symmetry of the hot spot and of areal density in the hemisphere of the converged fuel layer facing the camera are inferred. Image plates record a co-aligned >10 keV x-ray image of the implosion using the same aperture. Results from OMEGA cryogenic implosions are presented.

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