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Measuring radial profiles of nuclear burn in ICF implosions at OMEGA and the NIF using proton emission imaging F.H. SEGUIN, H.G. RINDERKNECHT, M. ROSENBERG, A. ZYLSTRA, J. FRENJE, C.K. LI, R. PETRASSO, MIT, F.J. MARSHALL, T.C. SANGSTER, LLE, N.M. HOFFMAN, LANL, P.A. AMENDT, C. BELLEI, S. LE PAPE, S.C. WILKS, LLNL — Fusion reactions in ICF implosions of D^3He-filled capsules produce 14.7-MeV D^3He protons and 3-MeV DD protons. Measurements of the spatial distributions of the D^3He and DD reactions are studied with a penumbral imaging system[1,2] that utilizes a CR-39-based imaging detector to simultaneously record separate penumbral images of the two types of protons. Measured burn profiles are useful for studying implosion physics and provide a critical test for benchmarking simulations. Recent implosions at OMEGA of CD capsules containing ^3He gas fill[3] and SiO_2 capsules containing low-pressure D^3He gas[4] were expected to have hollow D^3He burn profiles (in the ^3He-filled capsule, due to fuel-shell mix), but penumbral imaging showed that the reactions were centrally peaked due to enhanced ion diffusion. The imaging technique is to be implemented soon on the NIF. This work was supported in part by NLUF, DOE, and LLE.

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