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High Performance Capsule Implosions on the Omega Laser Facility with Rugby Hohlraums[1]

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Rugby-shaped hohlraums have been proposed as a method for x-ray drive enhancement for indirectly-driven capsule implosions [1]. This concept has recently been tested in a series of shots on the OMEGA laser facility at the Laboratory for Laser Energetics at the University of Rochester. In this talk, experimental results are presented comparing the performance of D_2-filled capsules between standard cylindrical Au hohlraums and rugby-shaped hohlraums. Not only did the rugby hohlraums demonstrate 18% more x-ray drive energy as compared with the cylinders, but the high-performance design of these implosions (both cylinder and rugby) also provided $\approx$ 20X more DD neutrons than any previous indirectly-driven campaign on Omega (and $\approx$ 3X more than ever achieved on Nova implosions driven with nearly twice the laser energy). This increase in performance enables, for the first time, a measurement of the neutron burn history of an indirectly-driven implosion. Previous DD neutron yields had been too low to register this key measurement of capsule performance and the effects of dynamic mix. A wealth of additional data on the fuel areal density from the suite of charged particle diagnostics was obtained on a subset of the shots that used D^3He rather than D_2 fuel. Comparisons of the experimental results with numerical simulations are shown to be in excellent agreement. The design techniques employed in this campaign, e.g., smaller NIF-like laser entrance holes and hohlraum case-to-capsule ratios, provide added confidence in the pursuit of ignition on the National Ignition Facility.

[1] P. Amendt, C. Cerjan, D. E. Hinkel, J. L. Milovich, H.-S. Park, and H. F. Robey, "Rugby-like hohlraum experimental designs for demonstrating x-ray drive enhancement", *Phys. Plasmas* **15**, 012702 (2008).

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