THE FIRST CAPSULE IMPLOSION EXPERIMENTS ON ORION

W.J. Garbett, C.J. Horsfield, S.G. Gales, A.E. Leatherland, M.S. Rubery, J.E. Coltman,
A.E. Meadowcroft, S.J. Rice, A.J. Simons, V.E. Woolhead
AWE plc, Aldermaston, Reading, Berkshire, UK
warren.j.garbett@awe.co.uk

Direct drive capsule implosions are being developed on the Orion laser [1] at AWE as a platform for ICF and HED physics experiments. The Orion facility is configured with 10 long pulse (ns) beams and two additional PW (ps) beams, which make it well suited for studying the physics of alternative ignition approaches. Orion implosions also provide the opportunity to study aspects of polar direct drive [2], with particular relevance to configurations being explored for direct drive shock ignition at LMJ [3].

The complexity of polar drive configurations, together with limitations on drive symmetry from the relatively small number of laser beams, makes predictive modeling of direct drive implosions challenging, resulting in some uncertainty in the expected capsule performance. Accordingly, initial experiments have been fielded to evaluate baseline capsule performance and inform future design and optimisation.

Implosions were performed using thin shell, deuterium filled, glass capsules. These were intended to produce exploding pusher-like dynamics, in order to minimize the impact of mix and asymmetry. A substantial suite of diagnostics was fielded to characterize the implosions, including the first use of Orion's neutron total yield and time-of-flight diagnostics, and time-gated x-ray imaging on multiple axes. Results from the experiments will be presented alongside radiation-hydrocode modeling and analysis.

[1] N. Hopps *et al.*, Appl. Opt. 52, 3597 (2013)
[2] S. Skupsky *et al.*, Plasma Phys. 11, 2763 (2004)
[3] M. Temporal *et al.*, Phys. Plasmas 21, 012710 (2014)