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Thermonuclear Yield Degradation Due to Low Mode Capsule Shape Asymmetries on NIF Inertial Fusion Implosions ROBBIE SCOTT[1], [A]STFC Rutherford Appleton Laboratory, Harwell Oxford, UK, D.S. CLARK, D.K. BRADLEY, D.A. CALLAHAN, M.J. EDWARDS, S.W. HAAN, M.M. MARINAK, R.P.J. TOWN, [B]Lawrence Livermore National Laboratory, Livermore, USA, P.A. NORREYS, [A], L.J. SUTER, [B] — The effects of Legendre polynomial P_4 capsule shapes on NIF inertial fusion implosions have been modelled using the radiation-hydrodynamics code Hydra. Large P_4 mode shapes cause regions of the hotspot/DT ice interface to become unstable during capsule deceleration, preventing stagnation; up to 50% of the peak capsule kinetic energy remains unconverted to hotspot pressure, causing hotspot pressures to fall by up to 3.5× and neutron yields to be reduced by up to 20×. Synthetic x-ray images show that positive P_4 amplitudes $> 5\mu$ m are undetectable experimentally when using cryogenic DT capsules. Analysis of DHe^3 filled CH capsules and comparison with NIF experimental data indicate that the yield reduction for DT capsules with the same x-ray drive would be $\sim 10 - 20\times$. The presence of undetectable P_4 modes would explain many characteristics of current NIF implosions including; large negative P_2 modes, the $\sim 30\mu$ m hotspot size, the low inferred pressures and hotspot masses, and most importantly the $\sim 10\times$ discrepancy between the measured capsule kinetic energy and the observed neutron yield. Experimental methods are proposed to infer the P_4 mode amplitude of DT capsules and then reduce this to ignition specification.

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