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A Measurable Three-Dimensional Lawson Criterion and Hydro-Equivalent Curves For Inertial Confinement Fusion[1] P. CHANG, K. ANDERSON, R. BETTI, University of Rochester — It is shown that a multi-dimensional ignition condition (Lawson criterion) can be cast in a form that depends on three measurable parameters of the compressed fuel assembly: the hot-spot ion temperature T, the neutron yield normalized to the 1-D prediction (Yield-Over-Clean, YOC) and the total areal density ρR including the cold shell contribution. A family of marginal-ignition curves is derived in the ρR-T plane. They are parameterized according to the YOC, and hydrodynamic simulations are compared with the ignition curves. On this plane, hydrodynamic equivalent curves show how a given implosion would perform with respect to the ignition condition when the laser-driver energy is varied. For $3 < T < 6$ keV, the 3D ignition condition can be approximated by a simple formula : $\rho R \cdot T^{2.6} \cdot YOC > 50 g/cm^2\ keV^{2.6}$, where ρR, T and YOC are the measured, neutron-averaged total areal density, hot-spot ion temperature and the neutron yield normalized to the 1-D prediction respectively. All quantities are calculated without accounting for the α-particle energy deposition. Such a criterion can be used to measure the Margin in the THD (Tritium, Hydrogen, Deuterium-poor targets) campaign on the National Ignition Facility and to determine how surrogate D_2 ,THD, and sub-ignited DT target implosions perform with respect to the ignition threshold.

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Po-Yu Chang
University of Rochester

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