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Measurable Lawson Criterium and Hydro-Equivalent Curves for Inertial Confinement Fusion R. BETTI, C.D. ZHOU, Fusion Science Center and Laboratory for Laser Energetics, U. of Rochester — The Lawson's criterion that determines the onset of thermonuclear ignition is usually expressed through the product $p\tau \approx 10$ atm s, where p is the plasma pressure and τ is the energy confinement time. In magnetic fusion devices, both the pressure and confinement time are routinely measured, and the performance of each discharge can be assessed by comparing the value of $p\tau$ with respect to the ignition value (10 atm s). In inertial fusion, both p and τ cannot be directly measured and the performance of a subignited ICF implosion cannot be assessed with respect to the ignition condition. Here, we derive a form of the Lawson's criterion that can be directly measured in ICF implosions. Such a new ignition criterion depends on the only two measurable quantities in the ICF fuel assembly: the total areal density and the hot-spot ion temperature. In cryogenic implosions, the total areal density can be measured through secondary proton spectroscopy, neutron spectroscopy, or x-ray radiography. The ion temperature is measured with the neutron time-of-flight (nTOF) diagnostic. Thus, one can use such a new criterion to assess how far current and future subignited ICF implosions are from achieving ignition. This work was supported by the U.S. Department of Energy under Cooperative Agreements DE-FC52-92SF19460 and DE-FC02-04ER54789.

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