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A Simple Model for ICF Double Shell Target Performance[1]
MORDECAI ROSEN, Lawrence Livermore National Laboratory — Hohlraum-driven double-shell capsules are being considered as ignition / moderate gain systems for the National Ignition Facility. We present a simple model for the performance of these double shell capsules by focusing on the dynamics of the inner Au shell and the DT gas within. We calculate the post shock conditions of the DT, followed by its adiabatic compression. At stagnation time, the ultra-high density Au shell is treated simply as a Fermi-degenerate system. We equate the peak kinetic energy of that shell to the internal energies of the DT and the Au upon stagnation. We close the system of equations via a pressure balance between the Au and the DT. This "hydro phase" of the analytic calculation results in predictions for peak DT density and temperature. We then calculate ignition criteria for this system and add a simple model for fusion burn-up and gain. Results from all of this are compared with published results of the simulations of Amendt et. al. (PoP 14, 056312 [2007]). We use our analytic formulae to study parameter variations such as DT initial density and radius as they vary with ICF driver scale.

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