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Performance of DT layered implosions on the NIF PRAVESH PATEL, PAUL SPRINGER, CHARLES CERJAN, TAMMY MA, NIKO IZUMI, DANIEL CLARK, BRIAN SPEARS, MICHAEL KEY, NINO LANDEN, JOHN LINDL, JOHN EDWARDS, Lawrence Livermore National Laboratory — We describe the performance of indirectly-driven deuterium-tritium (DT) layered target experiments conducted on the National Ignition Facility (NIF) in terms of the experimentally derived thermodynamic properties of the hot spot and dense fuel at stagnation. An isobaric model of the assembled fuel is constructed with data from an array of nuclear and x-ray diagnostics providing absolute, spatial, temporal, and spectral information, and is used to determine the fuel pressure, volume, and energy. The model accounts for the possible presence of CH ablator mixed into the hot spot, which has the signature of enhanced radiation energy loss. This mix mechanism is found to be a principal contributor to the large variation in the neutron yield over clear (YOC) observed across the campaign. Achieving the hot spot conditions necessary for significant alpha heating and ignition requires the efficient conversion of the shell kinetic energy to thermal energy of the DT fuel at stagnation. In high convergence implosions the thermal energy of the fuel at stagnation is inferred to be ∼60% of the delivered energy, and energies of ∼1.5-1.8 kJ have been achieved in the hot spot, approximately 30-40% of that required for ignition. Performance metrics will be compared across a range of implosions varying in velocity, adiabat, and convergence ratio.

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