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Hydro-scaling of DT implosions on the National Ignition Facility PRAVESH PATEL, BRIAN SPEARS, DAN CLARK, Lawrence Livermore National Laboratory — Recent implosion experiments on the National Ignition Facility (NIF) exceed 50 kJ in fusion yield and exhibit yield amplifications of >2.5-3x due to alpha-particle self-heating of the hot-spot. Two methods to increase the yield are (i) to improve the implosion quality, or stagnation pressure, at fixed target scale (by increasing implosion velocity, reducing 3D effects, etc.), and (ii) to hydrodynamically scale the capsule and absorbed energy. In the latter case the stagnation pressure remains constant, but the yield—in the absence of alpha-heating—increases as Y~S^4.5, where the capsule radius is increased by S, and the absorbed energy by S^3. With alpha-heating the increase with scale is considerably stronger. We present projections in the performance of current DT experiments, and the extrapolations to ignition, based on applying hydro-scaling theory and accounting for the effect of alpha-heating. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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