The High-foot Implosion Campaign on the NIF

O.A. Hurricane

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The ‘High-Foot’ platform [1, 2, 3, 4] manipulates the laser pulse-shape coming from the National Ignition Facility (NIF) laser to create an indirect drive 3-shock implosion that is significantly more robust against instability growth involving the ablator and also modestly reduces implosion convergence ratio. This strategy gives up on theoretical high-gain in an inertial confinement fusion implosion in order to obtain better control of the implosion and bring experimental performance in-line with calculated performance, yet keeps the absolute capsule performance relatively high. In this paper, we will cover the various experimental and theoretical motivations for the High-Foot drive as well as cover the experimental results that have come out of the High-Foot experimental campaign. At the time of this writing the high-foot implosion has demonstrated record total DT yields ($9.3 \times 10^{15}$ neutrons, equivalent to 26 kJ) with low levels of inferred mix, excellent agreement with implosion simulations, fuel energy gains exceeding unity, and evidence for the “bootstrapping” associated with alpha-particle self-heating. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344.

References


