Development of Improved Radiation Drive Environment for High Foot Implosions at the National Ignition Facility

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Improvements in the radiation environment of High Foot implosions [1], i.e., the hohlraum, have resulted in enhanced performance. Recent High Foot implosions use a hohlraum that, compared to the previous high gas-fill hohlraum, is longer, has a larger case-to-capsule ratio, and a lower gas fill density. In addition, these hohlraums are fielded using zero wavelength separation between inner and outer beams, in order to minimize any reliance on spatio-temporal variations in intensity caused by cross-beam energy transfer [2]. These modifications have helped to improve symmetry control of High Foot implosions. Additionally, laser energy coupling to the hohlraum is increased, most notably with reduced SRS. Further, the level of preheating hot electrons is reduced substantially and is now well within ignition specification.

At fixed laser energy, High Foot implosions driven with this improved hohlraum have achieved a 1.4 x increase in stagnation pressure, with an accompanying relative increase in fusion yield of 50% as compared to a reference experiment with the same laser energy. Further improvements in the radiation environment are ongoing, and include a 10% larger case-to-capsule ratio (90% capsule size). Recent experiments, using this larger case-to-capsule ratio, have demonstrated a round implosion with little symmetry swing between a convergence ratio of 5 and the final compressed state. Results of upcoming DT experiments will be presented and compared to previous implosions.

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