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Kinetic Mix in Gas-filled Inverted Corona Fusion Experiments[1]

WILLIAM RIEDEL, Stanford Univ, NATHAN MEEZAN, DREW HIGGINSON, MATTHIAS HOHENBERGER, Lawrence Livermore National Lab, MARK CAPPELLI, SIEGFRIED GLENZER, Stanford Univ — In this work we investigate the effect of gas fill density on kinetic mixing and yield performance of laser-driven inverted corona fusion experiments. Inverted corona targets consist of a fuel layer lined along the interior surface of a hollow or gas-filled plastic hohlraum that is laser-ablated and expands inward towards the hohlraum center. Previous experiments have demonstrated the potential of such targets as neutron sources: DD yields over 10^{10} have been achieved at OMEGA and DT yields at NIF are expected to exceed 10^{14} using single-sided illumination and with low uniformity requirements. The plasma streams generated in these targets can be initially nearly collisionless as they converge and interpenetrate. Such interactions are difficult to model using standard magnetohydrodynamic (MHD) simulations, which assume high collisionality. Instead we model the system kinetically using the hybrid particle-in-cell (PIC) code Chicago to explore the importance of kinetic ion effects during stagnation. Simulations show that at low fill densities mixing can occur between the shell wall and the gas, modifying the plasma composition in the stagnation region and affecting yield performance. Predicted behavior is compared to OMEGA experimental results.

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