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On the sensitivity of bulk hot spot motion in inertial confinement fusion implosions under the presence of x-ray flux asymmetries[1]

RYAN NORA, DAN CASEY, BRIAN MACGOWAN, BRIAN SPEARS, CHRIS YOUNG, Lawrence Livermore Natl Lab — We present a model detailing the sensitivity of inferred bulk hot-spot motion in inertial confinement fusion implosions in the presence of x-ray flux asymmetries. Bulk hot-spot motion is inferred through neutron time of flight diagnostics on the National Ignition Facility and are indicative of collective motion within the hot spot. This bulk hot-spot motion is most notably pronounced when in implosions with large spherical harmonic mode one (l=1) asymmetries but can also result from aneurisms in the dense shell. Implosions on the National Ignition Facility however typically comprise of multiple simultaneous asymmetries and the interaction of asymmetries can impact the observables. In this work we perform 3D HYDRA [1] simulations to investigate low mode x-ray flux asymmetry mode-coupling and observe the sensitivity of the direction and magnitude of the bulk hot-spot motion. We find oblate (pancake) stagnated shell geometries inhibit the motion to a larger degree than prolate (sausage) ones. We verify this relationship in the presence of multi-mode flux asymmetries and apply the knowledge to experimental data taken on the National Ignition Facility.

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