Ultra High Mode Mix in NIF NIC Implosions

Robbie Scott [1], Warren Garbett [2]
1) STFC Rutherford Appleton Laboratory, Harwell Oxford, UK E-mail:
robbie.scott@stfc.ac.uk
2) AWE Aldermaston, Reading, Berkshire, UK

This work re-examines a sub-set of the low adiabat implosions from the National Ignition Campaign [1] in an effort to better understand potential phenomenological sources of 'excess' mix observed experimentally. An extensive effort has been made to match both shock-timing and backlit radiography (Con-A)[2] implosion data in an effort to reproduce the experimental conditions as accurately as possible. Notably a ~30% reduction in ablation pressure at peak drive is required to match the experimental data.

The reduced ablation pressure required to match the experimental data allows the ablator to decompress, in turn causing the DT ice-ablator interface to go Rayleigh-Taylor unstable early in the implosion acceleration phase. Post-processing the runs with various mix models indicates high-mode mix from the DT ice-ablator interface may penetrate deep into the hotspot. This work offers a potential explanation of why these low-adiabat implosions exhibited significantly higher levels of mix than expected from high-fidelity multi-dimensional simulations. Through this new understanding, a possible route forward for low-adiabat implosions on NIF is suggested.

References

[1] Lindl *et al*., Physics of Plasmas 21, 020501 (2014)

[2] Hicks *et al*., Physics of Plasma s19, 122702 (2012)