Diagnosing Low-Mode ($\ell \le 6$) and Mid-Mode ($6 < \ell \le 40$) Asymmetries in the Explosion Phase of Laser-Direct-Drive DT Cryogenic Implosions on OMEGA



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Summary

Simulations of DT cryogenic implosions indicate low- and mid-mode asymmetries can be diagnosed from gated x-ray images recorded during the explosion phase

- Shell breakup cannot be detected in hot-spot images of DT cryogenic implosions on OMEGA
- X-ray signatures for the shell breakup are explored in the explosion phase where the shell break up is expected to be exaggerated
- The timing in the implosion and the energy band of the emission are optimized to diagnose shell asymmetry measurements

Preliminary explosion phase measurements recorded for an OMEGA DT cryogenic implosion show that it is feasible to diagnose low- and mid-mode asymmetries.



Collaborators



R. C. Shah, D. Cao, V. Gopalaswamy, R. Betti, D. Patel, C. Stoeckl, W. Theobald, K. M. Woo, and S. P. Regan

University of Rochester Laboratory for Laser Energetics



Shell breakup cannot be detected in hot-spot images of DT cryogenic implosions on OMEGA

Three-dimensional ASTER simulation showing beam mode





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The x-ray signature for the corona–fuel interface is driven by the hydrodynamic structure, which is quantitatively similar during the deceleration and explosion phases.



Mid-mode asymmetries are prominent if soft x-ray gated images are obtained during the explosion phase





Soft x-ray gated images recorded in the explosion phase reflect the density nonuniformity





The ℓ = 10 mode amplitude increases between the deceleration and explosion phases





First data from a recent DT cryogenic implosion campaign on OMEGA show a modulated emission ring



Work is now underway to establish approaches to quantify the variability of the data.



Summary/Conclusions

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