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10.10 Analysis of systematic trends in experimental observables for direct-drive cryogenic targets on OMEGA

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A technique for identifying trends in performance degradation for inertial confinement fusion implosion experiments will be discussed. It is based on reconstruction of the implosion core with a combination of low- and mid-mode asymmetries. This technique was applied to the ensemble of hydro-equivalent deuterium--tritium implosions on OMEGA that achieved hot-spot pressures $\approx 56 \pm 7$ Gbar.⁽¹⁾ The analysis suggests that in addition to low modes, that can cause a degradation of the stagnation pressure mid modes are present that reduce the size of the burn volume. The systematic analysis shows that asymmetries can cause an overestimation of the total areal density in these implosions. It is also found that an improvement in implosion symmetry resulting from correction of either the systematic mid or low modes would result in an increase of the hot-spot pressure from 56 Gbar to ≈ 80 Gbar. This material is based upon work supported by the Lawrence Livermore National Laboratory under subcontract B614207 and by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944. (1)S. Regan et al., Phys. Rev. Lett. 117, 025001 (2016)

Primary author(s) : BOSE, Arijit (University of Michigan)

Presenter(s) : BOSE, Arijit (University of Michigan)

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