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Overview of recent experiments on hydrodynamic instabilities at ablation front ALEXIS CASNER, CEA, DAM, DIF, F-91297 Arpajon, France

— Understanding and mitigating hydrodynamic instabilities is a key element for achieving ignition in Inertial Confinement Fusion (ICF). Cryogenic indirect-drive implosions on NIF have evidenced that the ablative Rayleigh-Taylor Instability (RTI) is the dominant driver of hot spot mix. This motivates in particular the switch to a more forgiving higher adiabat implosion design. After a recall of some results obtained in indirect drive (ID) on the OMEGA laser facility in the last decade, I will explain how the unique capabilities of the National Ignition Facility could be harnessed to accelerate planar samples over much larger distances and longer time periods than previously achieved. I will describe a fundamental science proposal which aims at achieving a highly nonlinear stage for the ablative RTI, a question also of crucial interest in astrophysics. The existence of a turbulent-like regime at ablation front is in fact not precluded and the late-time dynamics of single-mode RTI is a subject of theoretical investigations. On the other hand in direct drive (DD) ICF, laser intensity (and target surface) non uniformities seed the initial conditions of the ablative RTI. I will discuss DD planar experiments devoted to the study of laser imprint perturbations with special phase plates. As it is also the case in ID, simulations of the Richtmyer-Meshkov phase reversal during the shock transit phase is challenging, and of crucial interest because it sets the sign of the RTI growth factors. Future work will try to increase the accuracy of measurements when phase inversion is present, as well as to demonstrate advanced imprint mitigation using underdense foams.

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