Abstract for an Invited Paper
for the DPP06 Meeting of
The American Physical Society

Very-high-growth-factor planar ablative Rayleigh-Taylor experiments[1]

DAVID K. BRADLEY, LLNL

The Rayleigh-Taylor instability is an important factor in bounding the performance envelope of ignition targets. This paper describes an experiment for ablative RT instability that for the first time achieves growth factors close to those expected to occur in ignition targets at the National Ignition Facility. The large growth allows small-seed perturbations to be detected and can be used to place an upper bound on perturbation growth at the ablation front resulting from microstructure in the preferred Be ablator. The experiments were performed on the Omega laser using a halfraum 1.2 mm long by 2 mm diameter with a 75% laser entrance hole. The halfraum was filled with ~ 1 atm of pentane to delay gold plasma from closing the diagnostic line of sight down the axis of the halfraum. The ablator was mounted at the base of the halfraum, and was accelerated by a two stepped X-ray pulse consisting of an early time section ~ 100 eV to emulate the NIF foot followed by an approximately constant ~ 150 eV drive sustained over an additional 5-7ns. It is this long pulse duration and late time observation that is different from previous experiments, and is responsible for the large growth achieved. The growth of a 2D sinusoidal perturbation machined on the drive side of the ablator was measured using face on radiography. The diagnostic view remained open until ~ 10 ns at which time the growth factor was measured to be ~ 200. The trajectory of the ablator was measured using streaked backlit radiography. The design and analysis of the experiments is described, and implications for experiments on ignition target ablators are discussed.

[1]This work was performed under the auspices of U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.