EXPERIMENTAL OBSERVATION OF NONLINEAR MODE COUPLING IN THE ABLATIVE RAYLIEGH-TAYLOR INSTABILITY ON THE NIF

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We investigate on the National Ignition Facility the ablative Rayleigh-Taylor instability in the transition from linear to highly nonlinear regimes. This work is of particular importance to ICF where careful attention to the form of the rise to final peak drive is calculated to prevent the Rayleigh-Taylor instability from shredding the ablator in-flight and leading to ablator mixing into the cold fuel [1,2]. The growth of the ablative Rayleigh-Taylor (RT) instability was investigated using a planar plastic foil with pre-imposed two-dimensional broadband modulations. The foil is accelerated for up to 12ns by the x-ray drive created in a gas-filled Au radiation cavity with a radiative temperature plateau at 175 eV [3]. The 2D, broadband modulations were pre-imposed into the foil. Bubble merger and competition was observed in a highly nonlinear regime of RT instability. This experiment provides critical data needed to validate current theories on the ablative RTI from indirect drive which relies on the ablative stabilization of short-scale modulations [4] for ICF ignition. This paper will compare the experimental data to the current nonlinear theories.

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