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Simulation, Theory, and Observations of the Spectrum of the Rayleigh-Taylor Instability due to Laser Imprint of Planar Targets[1] M.J. KESKINEN, MAX KARASIK, J.W. BATES, A.J. SCHMITT, Plasma Physics Division, Naval Research Laboratory — A limitation on the efficiency of high gain direct drive inertial confinement fusion is the extent of pellet disruption caused by the Rayleigh-Taylor (RT) instability. The RT instability can be seeded by pellet surface irregularities and/or laser imprint nonuniformities. It is important to characterize the evolution of the RT instability, e.g., the k-spectrum of areal mass. In this paper we study the time-dependent evolution of the spectrum of the Rayleigh-Taylor instability due to laser imprint in planar targets. This is achieved using the NRL FAST hydrodynamic simulation code together with analytical models. It is found that the optically smoothed laser imprint-driven RT spectrum develops into an inverse power law in k-space after several linear growth times. FAST simulation code results are compared with recent NRL Nike KrF laser experimental data. An analytical model, which is a function of Froude and Atwood numbers, is derived for the RT spectrum and favorably compared with both FAST simulation and Nike observations.

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