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Surface Roughness Instability Simulations of Inertial Confinement Fusion Implosions KRISTOPHER MCGLINCHEY, NICOLAS NIASSE, JEREMY CHITTENDEN, Imperial College London — Understanding hydrodynamic instabilities seeded by the inherit roughness on a capsule's surface is critical in quantifying an implosion's performance. Combined with instabilities on the ice-gas interface during the deceleration phase, their growth can lead to inhomogeneity in the shell's areal density. Recent work carried out at the National Ignition Facility (NIF) on surface roughness Rayleigh-Taylor Instability (RTI) growth rates show larger amplitudes in experiment as compared to simulation, even with a deliberately roughened surface [1]. We report on simulations of ICF experiments occurring at NIF using the Chimera code developed at Imperial College. Chimera is a fully explicit, Eulerian 3D multi-group radiation-hydrodynamics code utilising P1/3 automatic flux limiting radiation transport with opacity data from a non-LTE atomic model also developed at Imperial College. One-dimensional simulations are briefly presented to highlight that proper shock timing and stagnation properties have been achieved as are 2D harmonic perturbation simulations to benchmark their growth rates. Surface roughness implosions (initialised from metrology data) were then simulated for: shot N120321, a low-foot implosion with large surface perturbations and shot N130927, a high-foot implosion. Synthetic radiographs of these implosions were constructed at low convergence ratio (3-4) for comparison to experiment and at higher convergence to investigate what will be observable by new diagnostics in development at NIF. [1] V.A. Smalyuk et al, High Power Laser Science and Engineering, 2015

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