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Laser direct-drive IFE targets: sensitivity to fabrication and drive asymmetries[1] ANDREW J. SCHMITT, S.T. ZALESAK, J.W. BATES, D.E. FYFE, D.G. COLOMBANT, Naval Research Laboratory, Washington DC — A major challenge for direct-drive inertial fusion energy (IFE) is to create targets that produce significant gain and yet are resistant to the hydrodynamic instabilities that degrade yield. The seeds for these instabilities are the imperfections in both target manufacture and laser illumination. We consider fabrication flaws that occur primarily at surfaces and interfaces, and tend to peak at long wavelengths, although they are appreciable at small scales. Drive non-uniformities include those produced by optical smoothing, beam misalignment and power imbalance. Thus for laser direct-drive, the range of important unstable modes extends over a large wavelength range and to very small amplitudes. Accurate simulation of these modes places severe constraints upon the modeling. We discuss this, and present results using our massively-parallel radiation-hydrocode FAST, which is being used to simulate a variety of different IFE-based targets, including targets with low ignition energy ($E_{laser} \sim 500kJ, G \sim 10-50$), higher energy, high gain targets ($E_{laser} > 1MJ, G > 100$), and shock-ignition designs.

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