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P1.2002 Progress on weakly nonlinear hydrodynamic instabilities in spherical geometry

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In the ICF central ignition implosion, a spherical target is uniformly irradiated and ablatively compressed, creating the temperature and density conditions (i.e., the stagnation pressure) necessary to achieve thermonuclear ignition. Throughout the entire ICF implosions, the integrity of the compressed shell is of critical importance. The final fuel assembly must consist of a low-density, high-temperature core surrounded by a high-density, low-temperature shell to maximize the number of fusion reactions that can occur while the fuel is inertially confined. To create the fusion hot-spot, the shell must maintain its integrity throughout the implosion to prevent significant shell deformation, ablator material mixing into the central region, and thermal mixing between the hot core and cold fuel. Hydrodynamic instabilities are of significant concern when trying to achieve the highest integrity of the compressed shell possible in ICF implosions, which can compromise the shell's integrity throughout the implosion, rupturing the shell or quenching the hot-spot before the target maximum gain is achieved. In this report, we summarize the progress of theoretical research of hydrodynamic instabilities in spherical geometry in our group over the past several years.

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