2-D Particle-in-cell Simulations of Laser-Plasma Instabilities in Direct-drive ICF

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Laser-plasma instabilities are a major concern for directly driven inertial confinement fusion experiments, having the potential to scatter large fractions of the laser energy and divert it into hot-electrons that prematurely heat the fuel. Spherical implosion experiments at the OMEGA laser facility and polar direct-drive experiments at the NIF are presently leading towards ignition-scale direct-drive efforts [1]. These will involve a combination of high laser intensity and temperature, along with large density scale-lengths – a region of this parameter space which has not previously been thoroughly investigated [2].

Here we present 2D particle-in-cell simulations targeting these scales. We model individual intense speckles interacting with long scale-length density profiles. The behaviour of the Two-Plasmon Decay (TPD) and Stimulated Raman Scattering (SRS) instabilities is investigated in response to variation of the speckle intensity and density scale-length.

References

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