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Particle-in-Cell Simulations of the $2\omega_p$ Instability[1] F.S. TSUNG, W.B. MORI, UCLA, B.B. AFEYAN, Polymath Research Inc — A particle-in-cell code (OSIRIS) is used to investigate the two-plasmon decay instability in nonuniform plasmas of various density profiles. We find good agreement between the simulation and linear theory by Afeyan and Williams (Phys. Plas. **4**, 3827, 1997.) under a variety of laser and plasma conditions relevant to ICF. So far the theory has been tested for linear density profiles and parabolic density profiles where the perfect phase matching (PPMP) point is at the parabolic peak density. We will also test the theory's predictions concerning growth rates and eigeneconditions when the PPMP is in the transition region between the peak density of the parabolic profile and down on the flanks where strictly linear profile behavior is recovered. These simulations allow a check on linear theory, and also demonstrate the ability of PIC codes to study this instability in small regions of ICF relevant targets. Building on these experiences, we have now begun to investigate nonlinear effects on a longer time-scale, such as the saturation mechanism, the spectrum of the fast electrons at saturation, the relaxation and recurrence of the instability, and ion effects.

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