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Raman Amplification in the Wavebreaking Regime[1] MATTHEW EDWARDS, Department of Mechanical and Aerospace Engineering, Princeton University, ZEEV TOROKER, Department of Electrical Engineering, Technion Israel Institute of Technology, JULIA MIKHAILOVA, Department of Mechanical and Aerospace Engineering, Princeton University, NATHANIEL FISCH, Department of Astrophysical Sciences, Princeton University — Stimulated Raman scattering provides a plasma-based mechanism for transferring energy between laser pulses, allowing for the amplification of short laser pulses to intensities far beyond what is achievable with solid-state systems, but the method's usefulness depends on the identification of efficient parameter regimes robust to small inhomogeneities. The wavebreaking regime, characterized by the breakup of the Langmuir wave as the electron longitudinal quiver velocity exceeds the plasma-wave phase velocity, has been proposed as a potentially efficient regime for plasma amplification. Here we present particle-in-cell simulations of Raman amplification in this regime, showing that the breakup of the Langmuir wave is associated with lower amplification efficiencies. These results suggest that the search for optimal Raman amplification parameters should take place below, or not too far above, the wavebreaking threshold.

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