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Manipulating nonstationary plasmas through wave-particle interactions[1] PAUL SCHMIT, ILYA DODIN, NATHANIEL FISCH, Princeton University — Through both analytic theory and particle-in-cell simulations, the evolution of linear and nonlinear plasma waves is examined in plasma undergoing nonstationary processes such as compression and expansion. Plasmon conservation results in gradual amplification of linear wave energy in plasmas compressed longitudinally, while nonlinear waves embedded in compressing plasma are found to demonstrate even stronger amplification than linear waves. Different collisionless damping mechanisms for linear and nonlinear waves in nonstationary plasmas result similarly in the sudden switch-like conversion of wave energy into kinetic energy of fast particles. The new phenomenology encountered is shown to produce a number of unique and potentially useful effects, like the sudden selective heating of the plasma, the sudden generation of electrical current and magnetic field energy, and the effective reduction of plasma compressibility.

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Paul Schmit
Princeton University

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