Multi–Wave Model for Plasma–Wave Interaction

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Abstract

The problem of accelerating particles in a laser driven plasma is considered. A model is presented that describes the interaction of electrons with waves in a cold plasma. Starting from the Lagrangian for the system of fields, background plasma, and particles, a finite dimensional self-consistent model is derived using the envelope approximation for the waves. The (squared) wave amplitudes and phases form action-angle variables in the closed system of M waves and N_p particles. The system conserves energy and momentum, and thus is natural for solving the beam-loading problem. Numerical simulations are performed and some further simplifying approximations are considered to compare with earlier electrostatic problems.