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Very basic, applied, and in between approaches for the nonlinear kinetic description of electron plasma waves and stimulated raman scattering. DIDIER BENISTI, OLIVIER MORICE, ARNAUD DEBAYLE, CEA, DAM, DIF, 91297 Arpajon Cedex — In order to address large scale, and complex experiments, such as those involved in laser fusion, one needs to solve Vlasov-Maxwell equations. This requires the introduction of new theoretical results, since a purely numerical approach would be completely out of reach. As a first step, we show how to solve the nonlinear Vlasov equation when the charge density is induced by a sinusoidal electron plasma wave, and when wave-particle interaction is in the trapping regime. Our result is valid whatever the rate of variation of the wave amplitude. It goes beyond an envelope description. Moreover, for slowly-varying waves, we derive coupled envelope equations for stimulated Raman scattering in an inhomogeneous and non-stationary plasma. We also show how to solve our equations in a three-dimensional geometry by using a recently introduced Monte-Carlo ray-tracing method. Finally, we simplify our equations so as to come with a model that is being implemented in our hydrodynamical code at CEA, and will be used to design experiments at the Laser MegaJoule facility.

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