

Vlasov-Maxwell models for the laser-plasma interaction in the relativistic regime

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Abstract

We present Vlasov -Maxwell simulations to study short pulse high intensity laser-plasma interaction for moderately underdense and overdense plasmas. Vlasov codes solve the Vlasov equation as a partial differential equation (PDE) directly in phase space. This approach differs from the usual and well-known Particle in cell (PIC) codes. Due to their excellent resolution, they have proven to be a useful tool to study the nonlinear resonant wave-particle interaction, which may play a key role in laser plasma interaction. A well-known disadvantage is the need of large memory to ensure correct discretization in phase space. Here some pedagogical examples will be given to explain to the reader how to select the problems and numerical schemes in which Vlasov models and Vlasov simulations could be pertinent.