

Some numerical results relating to the spectral decomposition of a linearized Vlasov equation in a uniform magnetic field

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This work deals with the theoretical and numerical study of the 1d-2v Vlasov-Poisson system with uniform magnetic field.

Firstly, I will detail the spectral decomposition of a certain operator associated to the linearized VP equation, providing an alternative framework for the study of the magnetized VP equation to [2]. The ultimate goal of this spectral approach is to prove the Landau-Bernstein paradox [1, 5], which states that in unmagnetized plasmas the electric field exhibits Landau damping, whereas in magnetized plasmas Bernstein modes perpendicular to the magnetic field are undamped, independently of the magnetic field. This approach is related to abstract scattering theory, which deals with the perturbation of functional operators (in our case the magnetic field operator is regarded as a singular perturbation).

Secondly, I will present a discretization using a Semi-Lagrangian method with splitting [3, 4] to illustrate this spectral approach. More precisely I will show the numerical behavior of certain eigenvectors and exhibit the Landau-Bernstein paradox (using a standard initial data).

Références

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