

The rigorous derivation of unipolar Euler-Maxwell system for electrons from bipolar Euler-Maxwell system by infinity-ion-mass limit

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Abstract

In the paper, we consider the local-in-time and the global-in-time infinity-ion-mass convergence of bipolar Euler-Maxwell systems by setting the mass of an electron $m_e=1$ and letting the mass of an ion $m_i \rightarrow \infty$. We use the method of asymptotic expansions to handle the local-in-time convergence problem and find that the limiting process from bipolar models to unipolar models is actually decoupling, but not the vanishing of equations for the corresponding the other particle. Moreover, when the initial data is sufficiently close to the constant equilibrium state, we establish the global-in-time infinity-ion-mass convergence.

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