Modelization and AP kinetic scheme for the 2D bi-temperature dimensionless Euler system in a plasma

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Surging interests and concerns for alternative reliable sources of energy have led to consider fusion energy as a trustful candidate for tomorrow, as may witness the current ITER project. However, important costs and precise parameters of such a process require preliminary knowledge, modelization and numerical simulation of high temperature plasmas. The follows the path of the previous results from [4], [1] and [3]. First will be derived the dimensionless fluid bi-temperature Euler equations for an inert plasma composed with electrons and cations, and submitted to a transverse electromagnetic field. Through the computations, we will be discussing the role and magnitude of crucial plasma parameters. This derivation will result from the hydrodynamic limit of BGK-Vlasov-Maxwell equations. Then will be written an asymptotic preserving kinetic scheme relying on the general Aregba-Natalini procedure [2]. In particular, we will address nonconservative terms from the energies equations through a particular splitting procedure, and retrieve entropy dissipation as well as temperature and density positivity.

References

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