Nonlocal Transport Model Based On Entropic Closure Of Moment Equations

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Within the framework of inertial confinement fusion (ICF), the laser energy is absorbed in the hot and low density corona and is transferred by electrons to the denser part of the target, the ablation zone. This heat transfer is a crucial process that impacts on the target performance. The classical model of electron heat transport [1] does not allow to reproduce experimental data under ICF conditions, where the electron mean free path is comparable to the temperature scale length [2]. Advanced models based on the nonlocality, are required for ICF simulations.

The nonlocal transport model SNB [3] is based on a simplified and stationary kinetic Fokker-Planck (FP) equation, using the BGK collisional operators. It is in good agreement with kinetic results in regimes of interest for ICF [4] and it has been implemented into several multidimensional numerical codes. However, because of the structural properties of this model it is numerically difficult to take into account electromagnetic field effects on heat flux [5].

We present in this work another approach based on an entropic closure of FP moment equations [6]. It has been successfully applied for simulations of relativistic electron beam transport through dense plasmas [7]. It provides a more accurate description of collision processes and includes naturally the self-consistent fields and the Lorentz forces.

The model is extended to nonlocal electron transport in fusion plasmas, thanks to the implementation of the electron-electron linearized collision operator [8] which guarantees relaxation to the equilibrium state. Its features are highlighted and comparisons with existing nonlocal models are presented.

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