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Cosmological evolution of statistical system of scalar charged particles

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Abstract

© 2015, Springer Science+Business Media Dordrecht. In the paper we consider the macroscopic model of plasma of scalar charged particles, obtained by means of the statistical averaging of the microscopic equations of particle dynamics in a scalar field. On the basis of kinetic equations, obtained from averaging, and their strict integral consequences, a self-consistent set of equations is formulated which describes the self-gravitating plasma of scalar charged particles. It was obtained the corresponding closed cosmological model which also was numerically simulated for the case of one-component degenerated Fermi gas and two-component Boltzmann system. It was shown that results depend weakly on the choice of a statistical model. Two specific features of cosmological evolution of a statistical system of scalar charged particles were obtained with respect to cosmological evolution of the minimal interaction models: appearance of giant bursts of invariant cosmological acceleration Ω at the time interval $8 \cdot 10^3$–$2 \cdot 10^4$ tPl and strong heating (3–8 orders of magnitude) of a statistical system at the same times. The presence of such features can modify the quantum theory of generation of cosmological gravitational perturbations.

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Keywords

Inflation, Particle physics—cosmology connection, Phantom scalar interaction, Physics of the early universe