

Kinetics of small perturbations in an isotropic world - III. Long-wavelength perturbations in an ultrarelativistic gas

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Abstract

Long-wavelength gravitational perturbations are studied in an isotropic expanding universe filled with an ultrarelativistic gas. A kinetic study in the collisionless approximation shows that scalar and vector perturbations which appear at a time $\eta_0 \ll 1/n$, where N is the wave vector and η is the time coordinate x^4 , grow if the perturbation of the macroscopic momentum density of the gas at time η_0 is nonvanishing. The growth continues until the time $\eta_1 = 27\eta_0$, at which the perturbation of the macroscopic momentum density of the gas vanishes. A solution is also derived for tensor perturbations in the limit $n\eta \ll 1$. © 1978 Plenum Publishing Corporation.

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