

Conformal symmetry and cosmological entropy production

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Abstract

Introducing an effective refraction index of an Isotropic cosmic medium, we investigate the cosmological fluid dynamics which is consistent with a conformal, timelike symmetry of a corresponding "optical" metric. We demonstrate that this kind of symmetry is compatible with the existence of a negative viscous pressure and, consequently, with cosmological entropy production. We establish an exactly solvable model according to which the viscous pressure is a consequence of a self-interacting one-particle force which is self-consistently exerted on the microscopic particles of a relativistic gas. Furthermore, we show that a sufficiently high decay rate of the refraction index of an ultrarelativistic cosmic medium results in an inflationary expansion of the universe.

Keywords

Cosmology, General Relativity, Inflationary Universe, Kinetic Theory, Thermohydrodynamics