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An alternative approach for dark matter and its distribution function

The formalism of the Kinetic Theory of Relativistic Gases provides a geometrical framework to obtain the distribution function of the matter components. Such distribution function possesses the symmetries of the space-time in which it is embedded. In this talk we present the distribution function for a matter component in a Friedmann-Robertson-Walker (FRW) universe. Once the more general properties of the distribution function for a collisionless gas are derived, we will study the cosmological evolution of this gas in a homogeneous, isotropic and spatially flat universe. We will find that the gas behaves like radiation at early times and like dust at late times. This opens the question of whether the dark matter of the universe can behave like this relativistic kinetic gas. Therefore, we will analyze the cosmological implications of a component of dark matter with these properties at both, background level and linear perturbations. We found that the standard Cold Dark Matter model can be described by the distribution function associated to a FRW universe after a transition stage at early times from a radiation-like to dust-like matter.

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