

Scalar dark matter candidate during postinflationary epoch

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We study the gravitational production as the mechanism responsible for the creation of dark matter during the early epochs of the Universe. The dark matter candidate is modelled as a scalar field not minimally coupled to gravity through the Ricci scalar. The importance of the oscillations of the scalar of curvature sourced by the inflaton is established as it enhances the particle production during the reheating stage in two different ways. On the one hand, the infrared modes are excited due to an instability induced in the field as the effective mass becomes imaginary. On the other hand, the ultraviolet modes are enhanced due to a resonant effect between the frequency of the field and the frequency of the scalar of curvature oscillations. This production mechanism imposes bounds on the parameters (mass and coupling to curvature) of the candidate field as its abundance is bounded by observations. In particular there are two different regions in the parameter space of the scalar field in which this is a suitable model for a dark matter candidate, one for light masses and other one for masses over the inflationary energy scale.

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