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Gravitational particle creation as a mechanism for vector dark matter production

Gravitational particle production of spectator fields due to the expansion universe during the inflationary and reheating phases of the early universe is of particular interest in the context of dark matter, since it allows to constrain the properties of the dark candidate
by comparing the density of particles produced with the observed dark matter abundance. In such processes, tachyonic instabilities arise as a consequence of the coupling to the curvature, greatly enhancing mode production. We consider a massive vector field that is coupled to the curvature scalar and the Ricci tensor only, and study its gravitational
production through inflation and reheating. We show how the mechanism is more efficient than in the case of a non-minimally coupled scalar field, giving rise to larger abundances. Moreover, we analyze the importance of the coupling to the Ricci tensor, which increases tachyonic nstabilities in the system, and constrain the mass of the dark particle and the values of the coupling constants by comparing the corresponding abundance with observations

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yes

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