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Dark matter from inflationary quantum fluctuations

We study superhorizon production of dark matter particles from quantum fluctuations of a spectator field during inflation. The dark matter density contrast has O(1) fluctuations in this type of scenarios which is not consistent with the CMB and LSS observations. We thus find the lower bound $m>10^{-24}$ eV on the mass of dark matter particles with momenta k>10/Mpc. This universal bound is independent of the spin of dark matter particles. Considering a sharply peaked initial power spectrum such that the dark matter particles only produce at scales k>10/Mpc, we find an analytical expression for the relic density of dark matter in terms of the initial power spectrum and transfer function.

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