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Non-extensive solution to Cosmological Lithium problem

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Big Bang nucleosynthesis (BBN) theory predicts the abundances of the light elements D, ^{3}He, ^{4}He and ^{7}Li produced in the early universe. The primordial
abundances of D and ^{4}He inferred from observational data are in good agreement with predictions, however, the BBN theory overestimates the primordial ^{7}Li
abundance by about a factor of three. This is the so-called "cosmological lithium problem". Solutions to this problem using conventional astrophysics and nuclear
physics have not been successful over the past few decades, probably indicating the presence of new physics during the era of BBN. We have investigated the impact on
BBN predictions of adopting a generalized distribution to describe the velocities of nucleons in the framework of Tsallis non-extensive statistics. This generalized
velocity distribution is characterized by a parameter q, and reduces to the usually assumed Maxwell-Boltzmann distribution for $q = 1$. We find excellent agreement
between predicted and observed primordial abundances of D, ^{4}He and ^{7}Li for $1.069 \leq q \leq 1.082$, suggesting a possible new solution to the cosmological
lithium problem.

Abstract Type

Talk

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