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Dark radiation from the axino solution of the gravitino problem

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Current CMB observations could confirm an increase of the effective neutrino degrees of freedom after primordial nucleosynthesis but before photon decoupling. We show that, if the gravitino problem is solved by a light axino, dark (decoupled) radiation emerges naturally in this period leading to a new upper bound on the reheating temperature $< 10^{10}$ GeV. In turn, successful thermal leptogenesis predicts such an increase. The LHC might endorse this opportunity. We identify several consistent cosmologies.

Summary

It is an absolutely new opportunity to determine the amount of radiation in the Universe from the CMB alone. Recent (first) publications of observations give mean values larger at the time of photon decoupling than at the time of primordial nucleosynthesis. As other explanations are missing we should search for explanations from particle physics. To our knowledge we provide the first possibility that is motivated from problems of the Standard Model and cosmology. We observe an astonishing coincidence for parameter values motivated by completely disconnected reasons. It is remarkable that we can obtain a consistent cosmology, e.g. also dark matter, at the same time.

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