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Axiverse-induced dark radiation problem

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String theory suggests that cosmology is populated by many light pseudoscalar axions (an “Axiverse” scenario). Their presence in early universe give rise to dark radiation, non-standard model contribution to radiation imprinted onto Cosmic Microwave Background (CMB). Due to complexity of string compactification, it is natural to expect number of axions to be several hundreds up to thousands. Although there have been hints of dark radiation from Planck satellite and WMAP experiment, we show in this talk that large number of axions in typical axiverse scenario produces dark radiation much larger than observable value. Motivated by this problem, we study moduli space of compactified manifolds allowing by this constraint. We show that G2 manifold can relax strong dependency between number of axions and dark radiation. In addition, under plausible condition on moduli mass matrix, a compactified manifold with sufficiently large number of axions gives a phenomenologically acceptable value of dark radiation. The application on G2 compactified M-theory is also presented in great detail.

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