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Kaluza-Klein Towers in the Early Universe: Phase Transitions, Relic Abundances, and Applications to Axion Cosmology

Tuesday 9 May 2017 15:45 (15 minutes)

In this talk, I discuss the early-universe cosmology of a Kaluza-Klein (KK) tower of scalar fields in the presence of a mass-generating phase transition. I focus on the time-development of the total tower energy density as well as its distribution across the different KK modes, and find that both of these features are extremely sensitive to the details of the phase transition and can behave in a variety of ways significant for late-time cosmology. I also apply this machinery to the example of an axion-like field in the bulk, tracing the flow of the individual KK energy densities over an enlarged axion parameter space that extends beyond those accessible to standard treatments. An important by-product of this analysis is the development of an alternate “UV-based” effective truncation of KK theories which has a number of interesting theoretical properties that distinguish it from the more traditional “IR-based” truncation typically used in the extra-dimension literature. [Based on arXiv:1612.08950 with Keith Dienes and Brooks Thomas.]

Summary

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