Matching Between Supersymmetric Effective Theory of Inflation and Pure de Sitter SUGRA.

Level: Research Magister

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Abstract

There is a general interest in the study of inflationary models using effective theories where quantum gravity is realized. The result is a family of theories that describe the dynamic of the quantum fluctuations produced during inflation. There are two different approaches to the physics of inflation: starting from fundamental principles to build the theory, or constructing the more general Lagrangian not knowing the small-scale (or large-scale) details underlying the fundamental theory of inflation. The first approach is known as top-down effective theory, and the second one is bottom-up effective theory. In the first case we assume that quantum gravity is realized by supersymmetry, which, we consider, is a broken symmetry of nature. In this project we match both lines of research using constrained superfields in the top-down derivation and CCWZ construction in the bottom-up case.

Effective theories are particularly useful when there is not a known or complete description of the phenomenon, it also includes the case in which the theory is specified but not computable, in simpler words, effective theories synthesize the relevant physics at the energy scale of interest. Recent developements of the

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effective field theory of inflation had led to predictions of the scale dependence of the density fluctuations, represented by the power spectrum. The fluctuation predicted by these models are meant to be tested within the next generation of CMB experiments, therefore it is of significant relevance to determine which models correspond to a more suitable description of the origin of the universe.

The result of each interpretation is an effective action that describes the dynamics of a field couple to gravity in a de Sitter background when space-time diffeomorphisms are broken to (time dependent) spatial diffeomorphism, and supersymmetry is also spontaneously broken. It is of considerable interest to develop a methodology to understand both analysis and determine when they are equivalent and what can produce a discrepancy. We found as a fact that both descriptions, within the range of validity of the effective action, are equivalent.