Institute for Research in
Fundamental Sciences

School of Astronomy

PhD Defense Session

Title:

Effective Field Theory and Consistency Relations for Inflationary Primordial Fluctuations

Candidate:

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Venue:

Seminar Room of
School of Particles and Accelerators

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Time:

9:00-10:00

Abstract

In this talk, I summarize my research regarding two approaches towards model-independent study of single field models for inflation. In the first part, I give a brief introduction to the standard cosmology and pinpoint its shortcomings. Then I elaborate on the way that the theory of inflation resolves the fine tuning of the big bang cosmology. In the second part, I explain the effective field theory (EFT) of inflation as a model-independent point of view on studying single field scenarios for inflation. I apply EFT method to a certain class of inflationary models called non-attractor inflation models, in which the background of the spacetime exponentially approaches dS space, leading to novel features such as violation of the Maldacena consistency condition that commonly holds for attractor single field models. Later, we discuss a higher-derivative model of inflation, called ``ghost condensation", that allegedly violates the entropy bound of de Sitter space, proposed by Arkani-Hamed et al. We show that adding a very tiny cosmological constant forbids the breakdown of the second law of thermodynamics in ghost inflation. Finally, we give an elaborate discussion on adiabatic modes in cosmology. We discuss the Weinberg theorem on the conservation of curvature perturbations and its loopholes, which leads to the super-Hubble evolution of the curvature perturbations in a few number of models such as non-attractor inflation and solid inflation. Moreover, we extend the pioneering work by Steven Weinberg on ``adiabatic modes in cosmology". We find many, so far overlooked, time dependent adiabatic modes and discuss their relevance to consistency conditions.