

## MP 12: Quantenfeldtheorie und Kosmologie

Zeit: Donnerstag 16:00–17:00

Raum: M010

MP 12.1 Do 16:00 M010

**A novel point of view on the conformal anomaly for quantised Dirac fields** — ●CLAUDIO DAPPIAGGI, THOMAS-PAUL HACK, and NICOLA PINAMONTI — II. Institut fuer Theoretische Physik - Universitaet Hamburg

One of the main and many lessons we learned from the study of scalar fields on globally hyperbolic backgrounds, is that we can account for the so-called quantum trace anomaly employing a modified version of the classical stress-energy tensor as well as a point-splitting regularization by means of an Hadamard bidistribution. In this talk we will show that such approach can be traded to Dirac fields yielding a similar result. Particularly we shall try to emphasize, that, although we are reproducing already known results, this point of view is, on the one hand, conceptually rigorous and clear while, on the other hand, it opens the road to possible applications in a cosmological scenario.

MP 12.2 Do 16:20 M010

**The new ekpyrotic ghost** — RENATA KALLOSH<sup>2</sup>, ●JIN U KANG<sup>1,3</sup>, ANDREI LINDE<sup>2</sup>, and VIATCHESLAV MUKHANOV<sup>1</sup> — <sup>1</sup>Arnold-Sommerfeld-Center for Theoretical Physics, Department of Physics, Ludwig-Maximilians-Universitaet Muenchen, Theresienstrasse 37, D-80333 Munich Germany — <sup>2</sup>Department of Physics, Stanford University, Stanford, CA 94305, USA — <sup>3</sup>Department of Physics, Kim Il Sung University, Pyongyang, DPR. Korea

The new ekpyrotic scenario attempts to solve the singularity problem by involving violation of the null energy condition in a model which combines the ekpyrotic/cyclic scenario with the ghost condensate the-

ory and the curvaton mechanism of production of adiabatic perturbations of metric. The Lagrangian of this theory, as well as of the ghost condensate model, contains a term with higher derivatives, which was added to the theory to stabilize its vacuum state. We found that this term may affect the dynamics of the cosmological evolution. Moreover, after a proper quantization, this term results in the existence of a new ghost field with negative energy, which leads to a catastrophic vacuum instability. We explain why one cannot treat this dangerous term as a correction valid only at small energies and momenta below some UV cut-off, and demonstrate the problems arising when one attempts to construct a UV completion of this theory.

MP 12.3 Do 16:40 M010

**Cosmological Particle Creation in States of Low Energy** — ●ANDREAS DEGNER — Institut für Theoretische Physik, Universität Leipzig

For the quantized linear scalar field on Friedman-Robertson-Walker spacetimes, states of low energy provide a well-motivated class of reference states. The low-energy property is approximately localized at some value of the cosmological time parameter. We present calculations of the relative particle production between a state of low energy at early time and another such state at later time. In an exponentially expanding universe, we find that the particle production may show oscillations with respect to the energy modes. The basis of the method for calculating the relative particle production is, in contrast to previously investigated approaches, completely rigorous. Approximations are only used at the level of numerical calculation.