

Cosmology and High Energy Physics II

Laboratoire Charles Coulomb
9 December 2016

Abstracts

Iosif Bena

Black Hole Microstate Geometries and the Information Paradox

Black holes are very interesting objects, whose physics brings Quantum Mechanics and General Relativity into sharp contrast. For example, Quantum Mechanics predicts that the black hole at the center of the Milky Way has an entropy of order 10^{90} , and hence has $e^{10^{90}}$ microstates, while General Relativity predicts that this black hole only has one microstate. I will explain the origin of this enormous discrepancy, which lies at the basis of Hawking's information paradox, and describe several steps towards its resolution. In particular, I will discuss the construction of smooth supergravity solutions that have the same charges and asymptotics as black holes and black rings, but do not have a horizon and argue that these solutions describe the typical microstates of extremal supersymmetric black holes. This in turn indicates that the classical black hole solutions are just thermodynamic approximations of the physics, that break down at the scale of the horizon. I will also discuss the extension of this to non-extremal black holes and its implication for the black hole information paradox and for the recent firewall controversy.

Philippe Brax

Massive gravity? Bigravity!

The nature of massive gravity has been problematic since the early days of Fierz and Pauli. I will give a short presentation of bigravity, which cures some of the original problems of massive gravity.

Karim Noui

Higher Derivative Scalar-Tensor Theories: going beyond Horndeski

...

Patrick Peter

Non-quantum equilibrium in the trajectory approach in quantum cosmology

I'll discuss the trajectory approach for quantum mechanics and apply it to quantum cosmology to discuss how it could potentially solve the singularity and BKL instability problems. Ill also discuss how one could possibly show an out-of-quantum-equilibrium initial state in the primordial perturbations that could reveal the hidden variables.

David Polarski

New results on the growth index

The growth index provides an interesting signature of different dark energy models, in particular LambdaCDM and modified gravity models. It offers also interesting mathematical problems. New results will be presented on both aspects.