

Seminarium Szkoły Doktorskiej NCBJ

Thursday, 24 March, 9:00

<https://www.gotomeet.me/NCBJmeetings/phd-seminar>

Speaker:

Jaime de Cabo Martin (Szkoła Doktorska NCBJ)

Title:

Inequivalent Quantum Cosmological bouncing models and the primordial structure

Abstract:

By quantising the background as well as the perturbations in a simple one fluid cosmological model, we show that there exists an ambiguity in the choice of relevant variables, potentially leading to incompatible observational physical predictions. In a classical inflationary background, the exact same canonical transformations lead to unique predictions, so the ambiguity we put forward demands a semiclassical background with a sufficiently strong departure from classical evolution. The latter condition is clearly satisfied by bouncing models. We propose coherent states as the tool for introducing the semiclassical universe. We solve the quantum dynamics of the perturbation modes both analytically and numerically and investigate the amplitude spectra of the perturbations. We study the underlying quantum state, the Bunch-Davies vacuum, from the point of view of late-time observers by means of the Bogolyubov transformations. In particular, we study the phase space probability distributions obtained with the standard coherent states built from instantaneous vacua. We discuss the issue of the temporal phase shift with which the modes emerge from the bounce as sine waves. Finally, we find that the model may be fitted to data and shed light on the physical universe, constraining free parameters of the bouncing universe.