

No Smooth Beginning for The Universe and Trans-Planckian Physics

Friday, 9 December 2022 14:40 (20 minutes)

In minisuperspace quantum cosmology, the Lorentzian path integral formulations of the no-boundary and tunneling proposals have recently been analyzed, but it has been pointed out that the wave function of linearized perturbations around a homogeneous and isotropic background is of an inverse Gaussian form and thus that their correlation functions are divergent. In this talk, I will discuss the problem and revisit this issue of the Lorentzian quantum cosmology by modifying the dispersion relation based on trans-Planckian physics. I consider two modified dispersion relations, the generalized Corley/Jacobson dispersion relation with higher momentum terms and the Unruh dispersion relation with a trans-Planckian mode cut-off, as examples, and show that the inverse Gaussian problem of perturbations in the Lorentzian quantum cosmology is hard to overcome with minimal modifications of the gravity theory, such as modifying the dispersion relation at short distances.

Primary author: Dr MATSUI, Hiroki (Yukawa Institute for Theoretical Physics, Kyoto University)

Presenter: Dr MATSUI, Hiroki (Yukawa Institute for Theoretical Physics, Kyoto University)

Session Classification: Parallel session A