

Lattice Simulations of Axion-U(1) Inflation

Thursday 9 May 2024 11:00 (45 minutes)

I will present the first nonlinear lattice simulation of an axion field coupled to a U(1) gauge field during inflation. The Chern-Simons coupling induces a tachyonic growth of one of the two helicities of this electromagnetic inflationary field, often invalidating the standard perturbation theory approach. We use the simulation to study the production of the gauge field on the lattice and its effect on scalar perturbation. We find that the evolution of the gauge field is highly sensitive to the choice of the spatial discretization scheme. After identifying a suitable discretisation scheme, I will present results on the statistics of the primordial curvature perturbation. We find high-order statistics to be essential in describing non-Gaussianity in the linear regime of the theory. On the contrary, non-Gaussianity is suppressed when the dynamics becomes nonlinear. This relaxes bounds from overproduction of primordial black holes, allowing for an observable gravitational waves signal at pulsar timing array and interferometers scales.

Author: CARAVANO, Angelo

Presenter: CARAVANO, Angelo