

Messengers of the very early universe: Gravitational Waves and Primordial Black Holes



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Lattice simulations of axion-U(1) inflation

I present the first nonlinear lattice simulation of an axion field coupled to a U(1) gauge field during inflation. The simulation allows to fully characterize 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 interferometer scales. Our work establishes lattice simulations as a crucial tool to study the inflationary epoch and its predictions.

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