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Lattice simulations of axion inflation

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If gauge fields are coupled to an axion field during inflation, they can lead to unique observational signatures. However, this system often shows strong backreaction effects, invalidating the standard perturbation theory approach. I will present the first nonlinear lattice simulation of an axion-U(1) system during inflation. The simulation is used to fully characterize the statistics of the primordial curvature perturbation ζ . We find high-order statistics to be essential in describing non-Gaussianity of ζ 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.

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