

New Horizons in Primordial Black Hole physics (NEHOP)



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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, such as primordial black holes and chiral gravitational waves. However, this system often shows strong backreaction effects, invalidating the standard perturbation theory approach. In this talk, I present the first nonlinear lattice simulation of an axion-U(1) system during inflation. We find that non-Gaussianity is large in the linear regime, whereas it is suppressed when the dynamics becomes nonlinear. This relaxes previous 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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