



Allgemeines Physikalisches Kolloquium

Donnerstag, 05.12.2024 - 16 Uhr c.t.



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Axion inflation

Cosmological inflation provides initial conditions for the subsequent 'big-bang' era consistent with observational data. After an overview of the general framework and basic phenomenological predictions, we explore the theoretical motivations behind a specific class of inflationary models known as axion inflation. The coupling between axion inflation and gauge fields can significantly enhance the amplitude of these fields, leading to diverse observational consequences, including non-Gaussianity at Cosmic Microwave Background (CMB) scales, a gravitational wave background detectable at Pulsar Timing Array (PTA) and interferometer scales, and the potential formation of Primordial Black Holes. We conclude by presenting recent results in the strong back-reaction regime, where gauge field amplification alters the inflationary dynamics in a complex, non-trivial manner.