

GRAVITY: CHALLENGES BEYOND GENERAL RELATIVITY

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Anomaly-induced Inflation in the Minimal Quartic Extension of Einstein's Gravity

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The exploration of modified gravity theories using cosmology has gained considerable attention in recent years. In this context, we investigate anomaly-induced inflation within the framework of a Born-Infeld type modified gravity theory, which represents a minimal extension of Einstein's gravity. This theory, elaborated in recent works [1][2][3], exhibits intriguing properties, including a unique vacuum and the presence of a single massless spin-2 particle in its particle spectrum. Our analysis focuses on trace-anomaly driven inflation, where inflationary dynamics are triggered by a quantum anomaly leading to a non-vanishing trace of the energy-momentum tensor contingent upon curvature terms.

Central to our investigation is the comparison between the Minimum Standard Model (MSM) and the Minimal Supersymmetric Standard Model (MSSM) scenarios, representing initial unstable and stable de Sitter phases, respectively. We demonstrate that the modified gravity framework imposes constraints crucial for viable inflationary dynamics. Notably, the presence of modified gravity facilitates a graceful exit from inflation, even near to the stable de Sitter solution in the case of MSSM.

Furthermore, we provide insights into observational constraints by deriving key inflationary parameters such as the spectral index and tensor-to-scalar ratio within the slow-roll regime. Our findings shed light on the interplay between modified gravity theories and inflationary cosmology, offering valuable implications for both theoretical and observational cosmology.

[1] I. Gullu, T. C. Sisman and B. Tekin, "Born-Infeld Gravity with a Massless Graviton in Four Dimensions," Phys. Rev. D 91, 044007 (2015).

[2] I Gullu, T. C. Sisman and B. Tekin, "Born-Infeld Gravity with a Unique Vacuum and a Massless Graviton," Phys. Rev. D 92, 104014 (2015).

[3] A. Karasu, E. Kenar and B. Tekin, "Minimal Extension of Einstein's Theory: The Quartic Gravity," arXiv:1602.02567 [hep-th].

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