Constraining inflationary models via de-Sitterization of Bianchi Cosmologies

Apurba Samanta and Rahul Kothari

School of Physical Sciences, Indian Institute of Technology Mandi, Himachal Pradesh, 175005, India

July 9, 2026

We present a novel idea: that an approximately de Sitter phase emerges dynamically in an anisotropic Bianchi universe driven by a scalar field with a general potential $V(\phi)$, through a condition we term *de Sitterisation*, without assuming a cosmological-constant like form. For a potential with higher-order correction $F(\phi)$, we show this correction remains subdominant whenever the model-independent bound $\alpha < 1$ holds, the relevant criterion being on $F(\phi)$ as a whole, not its individual coefficients — rendering de Sitterisation achievable across a broad class of scalar-field models. In this latter sense, $\alpha < 1$ acquires direct observational significance: it holds precisely over the slow-roll interval (ϕ_0, ϕ_e) and excludes exactly those models disfavoured by *Planck* data. Thus, $\alpha < 1$ serves as both a sufficient condition for de Sitterisation and an effective observational filter, bridging early-time anisotropic dynamics and the CMB-constrained inflationary regime.