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FROM EARLY INFLATION TO COSMIC ACCELERATION : A UNIFIED SCENARIO IN HOLOGRAPHIC $f(Q)$ GRAVITY

In this work, we present a unified cosmological scenario within the framework of holographic $f(Q)$ gravity, addressing both early-time inflation and late-time cosmic acceleration. For the inflationary epoch, we reconstruct the Hubble parameter using holographic dark energy (HDE) and derive the key inflationary observables, namely the scalar spectral index and the tensor-to-scalar ratio. Our results demonstrate excellent consistency with the latest Planck satellite data, validating the viability of the model during the early universe. For the late-time cosmology, we incorporate a matter sector and employ the Chevallier-Polarski-Linder (CPL) parameterization to characterize the dark energy equation of state. We perform a comprehensive Bayesian statistical analysis using a joint dataset of 31 Cosmic Chronometer (CC) and 26 Baryon Acoustic Oscillation (BAO) observations. Markov Chain Monte Carlo (MCMC) sampling is utilized to constrain the free parameters, and we present the corresponding confidence contour plots. The combined analysis reveals that the holographic $f(Q)$ gravity model successfully accommodates both inflationary and late-time accelerated expansion phases within a single theoretical framework, offering a compelling alternative to standard Λ CDM cosmology.

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