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Inflation in an effective gravitational model and asymptotic safety

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Abstract

© 2018 American Physical Society. We consider an inflationary model motivated by quantum effects of gravitational and matter fields near the Planck scale. Our Lagrangian is a resummed version of the effective Lagrangian recently obtained by Demmel, Saueressig, and Zanusso [A proper fixed functional for four-dimensional quantum Einstein gravity, J. High Energy Phys. 08 (2015) 113.JHEPFG1029-847910.1007/JHEP08(2015)113] in the context of gravity as an asymptotically safe theory. It represents a refined Starobinsky model, Leff=MP2R/2+(a/2)R2/[1+bln(R/μ2)], where R is the Ricci scalar, a and b are constants, and μ is an energy scale. By implementing the COBE normalization and the Planck constraint on the scalar spectrum, we show that increasing b leads to an increased value of both the scalar spectral index ns and the tensor-to-scalar ratio r. Requiring ns to be consistent with the Planck Collaboration upper limit, we find that r can be as large as r≃0.01, the value possibly measurable by Stage IV CMB ground experiments and certainly from future dedicated space missions. The predicted running of the scalar spectral index α=dns/dln(k) is still of the order -5×10-4 (as in the Starobinsky model), about 1 order of magnitude smaller than the current observational bound.

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