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Analysis of inflationary models in higher-dimensional uniform inflation

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We consider higher-dimensional uniform inflation, in which the extra dimensions expand at the same rate as three-dimensional non-compact space during inflation. We compute the cosmological perturbation in $D + 4$ dimensions and derive the spectral index n_s and the tensor-scalar ratio r. We analyze five inflationary models: chaotic inflation, natural inflation, quartic hilltop inflation, inflation with spontaneously broken SUSY, and R^2 inflation. By combining the results from these models with the Planck 2018 constraints, we discuss that it is not desirable for the extra-dimensional space to expand at the same rate as the three-dimensional non-compact space, except for the case of one extra dimension.

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