

General Relativity and Quantum Cosmology

Quantum fluctuations in planar domain-wall space-times: A possible origin of primordial preferred direction

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We study the gravitational effects of a planar domain wall on quantum fluctuations of a massless scalar field during inflation. By obtaining an exact solution of the scalar field equation in de Sitter space, we show that the gravitational effects of the domain wall break the rotational invariance of the primordial power spectrum without affecting the translational invariance. The strength of rotational violation is determined by one dimensionless parameter β , which is a function of two physical parameters, the domain wall surface tension σ and cosmological constant Λ . In the limit of small β , the leading effect of rotational violation of the primordial power spectrum is scale-invariant.

Comments: 5 pages, no figure; Section 2 is added; Introduction and Section 4 are modified; In v3, primordial curvature perturbation is discussed in Sec. 4; Introduction, Sec 2, and Sec 4 are modified

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