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The tensor bi-spectrum in a matter bounce V. SREENATH, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803, U. S. A., DEBIKA CHOWDHURY, L. SRIRAMKUMAR, Department of Physics, Indian Institute of Technology Madras, Chennai 600036, India — Matter bounces are bouncing scenarios wherein the universe contracts as in a matter dominated phase at early times. Such scenarios are known to lead to a scale invariant spectrum of tensor perturbations, just as de Sitter inflation does. In this work, we examine if the tensor bi-spectrum can discriminate between the inflationary and the bouncing scenarios. Using the Maldacena formalism, we analytically evaluate the tensor bi-spectrum in a matter bounce for an arbitrary triangular configuration of the wavevectors. We show that, over scales of cosmological interest, the non-Gaussianity parameter $h_{\rm NL}$ that characterizes the amplitude of the tensor bi-spectrum is quite small when compared to the corresponding values in de Sitter inflation. During inflation, the amplitude of the tensor perturbations freeze on super-Hubble scales, a behavior that results in the so-called consistency condition relating the tensor bi-spectrum and the power spectrum in the squeezed limit. In contrast, in the bouncing scenarios, the amplitude of the tensor perturbations grow strongly as one approaches the bounce, which suggests that the consistency condition will not be valid in such situations. We explicitly show that the consistency relation is indeed violated in the matter bounce.

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