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Primordial Graviton Production and Detection Prospects in the String Pre-Big Bang Scenario

We investigate the mechanism of primordial graviton production within the framework of string cosmology's pre-Big Bang scenario, focusing on the interpretation of the NANOGrav signal as a relic stochastic background of primordial gravitons.

Our analysis shows that the minimal version of the pre-Big Bang scenario encounters limitations in explaining the observed signal. However, generalized non-minimal extensions, whether preserving or breaking the S-duality symmetry during the high curvature regime (string phase), make this interpretation feasible.

In both frameworks, significant gravitational wave signals can be produced, spanning a wide range of frequencies. These signals have the potential to be detected by upcoming interferometric experiments such as Advanced LIGO, the Einstein Telescope, LISA, and DECIGO, offering the exciting prospect of multi-band detection.

This presentation will be based on:

1. I. Ben-Dayan, G. Calcagni, M. Gasperini, A. Mazumdar, E. Pavone, U. Thattarampilly and A. Verma, Gravitational-wave background in bouncing models from semi-classical, quantum and string gravity, JCAP 09, 026 (2024).
2. P. Conzinu, G. Fanizza, M. Gasperini, E. Pavone, L. Tedesco, and G. Veneziano, Constraints on the parameters of the Pre-Big Bang scenario from NANOGrav data, JCAP 02, 039 (2025).

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