

Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

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WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

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Investigating cosmic histories with a stiff era through Gravitational Waves

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We investigate the potential of gravitational-wave background searches to constrain cosmic histories characterised by a stiff equation of state, preceded by a period of matter domination. Such a scenario leads to a characteristic peak in the primordial gravitational-wave spectrum originating from cosmological inflation. Assuming instant transitions between distinct epochs, which allows an analytical treatment of the gravitational-wave spectrum, we perform a Bayesian inference analysis to derive constraints from the first three observing runs of the LIGO-Virgo-KAGRA Collaboration. Additionally, we consider a smooth transition, employing an axion-like particle physics model, and highlight the difference with the instant transition approximation. We then forecast detection prospects for such a cosmic history through future gravitational-wave experiments.

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