Unbraiding the Bounce

David A. Dobre,[a] **Andrei V. Frolov,**[a] **José T. Gálvez Ghersi**[a,b] **Sabir Ramazanov**[c] **and Alexander Vikman**[c]

[a]Department of Physics, Simon Fraser University,
 8888 University Drive, Burnaby, British Columbia V5A 1S6, Canada

[b]Perimeter Institute for Theoretical Physics,
 31 Caroline Street North, Waterloo, Ontario, N2L 2Y5, Canada

[c]CEICO-Central European Institute for Cosmology and Fundamental Physics,
 Institute of Physics, the Academy of Sciences of the Czech Republic,
 Na Slovance 2, 182 21 Prague 8, Czech Republic

 E-mail: ddobre@sfu.ca, frolov@sfu.ca, joseg@sfu.ca, ramazanov@fzu.cz,
 vikman@fzu.cz

Abstract. We study a recently proposed by Ijjas and Steinhardt particular realization [1] of the cosmological bounce scenario. First, we reveal the exact construction of the Lagrangian used in [1]. This explicit construction allowed us to study other cosmological solutions in this theory. In particular we found solutions with superluminal speed of sound and discuss the consequences of this feature for a possible UV-completion. Further, following the originally constructed background history, we evaluated the tensor and scalar spectra during the bouncing phase characterized by the violation of null (and strong) energy condition. We found that the change of the speed of sound is the cause of the dominance of the tensor power spectrum over the scalar part through most of the bounce. Moreover, we observe that none of the spectra evaluated across the bouncing phase is scale invariant. In addition to this, we present our results for particle production by showing the evolution of the occupation number of scalar fluctuations through the bounce.

Contents

1 Introduction

Acknowledgments

References

[1] A. Ijjas and P. J. Steinhardt, "Classically stable nonsingular cosmological bounces," *Phys. Rev. Lett.* **117** no. 12, (2016) 121304, `arXiv:1606.08880 [gr-qc]`.