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Sweeping vacuum gravitational waves under the rug

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Citation

Negro, A. (2024, October 1). *Sweeping vacuum gravitational waves under the rug*. Retrieved from <https://hdl.handle.net/1887/4093391>

Version: Publisher's Version

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Sweeping Vacuum Gravitational Waves Under The Rug

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op dinsdag 1 oktober 2024
klokke 14:30 uur

door

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geboren te Treviso, Italië
in 1996

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The cover shows vacuum gravitational waves propagating through the Cosmic Microwave Background (credit: ESA and the Planck Collaboration) and the first galaxy clusters (credit: NASA, ESA, CSA, and STScI). Vacuum gravitational waves are expected to have been present since the very beginning of our universe, as they are a consequence of the inclusion of primordial vacuum quantum perturbations. In turn, these are represented by the loop Feynman diagrams “swept” under the Cosmic Microwave Background “rug”, in the bottom right corner of the front cover.

Glossary

n Neutron.

p Proton.

γ Photon.

ν Neutrino.

Λ CDM Standard Cosmological model.

G_N Newtonian constant.

M_{pl} Plank mass.

$e^{+/-}$ Positron/Electron.

BBN Big Bang Nucleosynthesis.

CMB Cosmic Microwave Background.

DoF Degree of Freedom.

dS de Sitter.

EOM Equation of Motion.

FLRW Friedmann-Lemaitre-Robertson-Walker.

GR General Relativity.

GUT Grand Unification Theory.

GWs Gravitational Waves.

IR Infrared.

LSS Large Scale Structures.

QCD Quantum Chromodynamics.

QED Quantum Electrodynamics.

QFT Quantum Field Theory.

RD Radiation Dominated.

SSB Spontaneous Symmetry Breaking.

SVT Scalar Vector Tensor (decomposition).

UV Ultraviolet.

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