

# Naturalness, renormalization and the cosmological constant problem

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It has been known for a long time, since the seminal works of Fradkin and Tseytlin as well as Taylor and Veneziano, that the calculation of the (euclidean) effective action in quantum gravity gives rise to quartic and quadratic UV-sensitive contributions (Planck scale) to the vacuum energy. The comparison of this result to the measured value of the vacuum energy, that is inferred from the observed accelerated expansion of the universe, reveals an extremely severe naturalness problem. Nowadays, this issue is well known as the strongest facet of the “cosmological constant problem”. In this talk, I will show that the appearance of these UV-sensitive terms is due to a not entirely correct treatment of the measure in the path integral. We will see that, when the measure is fully taken into account, these terms completely disappear and the vacuum energy only presents a mild logarithmic sensitivity to the UV scale. I will then explain why usual calculations give rise to quartic and quadratic UV-terms.

**Primary authors:** PERNACE, Arcangelo (Istituto Nazionale di Fisica Nucleare); BRANCHINA, Carlo (LPTHE Sorbonne Université); CONTINO, Filippo (Istituto Nazionale di Fisica Nucleare); BRANCHINA, Vincenzo (University of Catania)

**Presenter:** PERNACE, Arcangelo (Istituto Nazionale di Fisica Nucleare)