Contribution ID: **28** Type: **Oral contribution**

Understanding gravitationally induced decoherence parameters in neutrino oscillations using a microscopic quantum mechanical model

Tuesday 8 July 2025 11:40 (20 minutes)

In this talk, the role of gravitationally induced decoherence in open quantum systems is explored in the context of neutrinos. A microscopic quantum mechanical model introduced by Blencowe and Xu is applied to neutrino oscillations, motivated by the coupling between neutrinos and the gravitational wave environment suggested by linearised gravity. The analysis demonstrates that, for neutrino oscillations in vacuum, gravitationally induced decoherence matches phenomenological models, with decoherence parameters exhibiting an inverse quadratic energy dependence. When matter effects are included, the decoherence parameters depend on the varying matter density across the earth's layers. Moreover, the form of the decoherence parameters is explicitly derived from the microscopic model, providing a physical interpretation. This talk is based on the work in "Understanding gravitationally induced decoherence parameters in neutrino oscillations using a microscopic quantum mechanical model", published in JCAP, 2024, 11, 006.

Working Group

WG1 - High Energy QG Theory

Authors: Dr DOMI, Alba (Friedrich Alexander Universität Erlangen-Nürnberg); Prof. GIESEL, Kristina (Friedrich Alexander Universität Erlangen-Nürnberg); HENNIG, Lukas (Friedrich Alexander Universität Erlangen-Nürnberg); Dr FAHN, Max Joseph (Università di Bologna); KOBLER, Michael (Friedrich Alexander Universität Erlangen-Nürnberg); KEMPER, Roman (Friedrich Alexander Universität Erlangen-Nürnberg); Dr EBERL, Thomas (Friedrich Alexander Universität Erlangen-Nürnberg); Prof. KATZ, Ulrich (Friedrich Alexander Universität Erlangen-Nürnberg)

Presenter: KEMPER, Roman (Friedrich Alexander Universität Erlangen-Nürnberg)

Session Classification: WG1 High Energy QG Theory 2