## 15th annual conference on Relativistic Quantum Information (North)



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## Gravitationally induced decoherence of scalar particles from field theory

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The formalism of open quantum systems provides a way to derive evolution equations, called master equations, for a quantum system of interest that is coupled to an environment, without the need to solve the dynamics of the environment in detail. The starting point of this talk is a master equation for a scalar field as system of interest in an environment of quantised linearised gravity from arXiv:2206.06397. The main focus is on considering its projection onto the one-particle space in order to obtain the decoherence induced by the gravitational environment on a single scalar particle. Special emphasis is put on the renormalisation of the resulting one-particle master equation which contains UV-divergent terms. To this end, the individual contributions of the master equation are linked to the underlying effective QFT and its Feynman diagrams, allowing an analysis of the origin of the divergent terms and a way how to renormalise them. Finally, the model is applied as a toy model to a neutrino in order to gain some insights into gravitationally induced decoherence in neutrino oscillations.

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