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Microscopic derivation of open quantum Brownian motion¹

FRANCESCO PETRUCCIONE, ILYA SINAYSKIY, University of KwaZulu-Natal and National Institute for Theoretical Physics (KZN), UKZN TEAM — Recently a model of open quantum Brownian motion (OQBM) [M. Bauer, D. Bernard, A. Tilloy, Phys. Rev. A 88 (2013) 062340] was introduced as a scaling limit of Open Quantum Walks (OQWs) [S. Attal, F. Petruccione, C. Sabot, I. Sinayskiy, J. Stat. Phys. 147 (2012) 832]. OQBM is a new type of quantum Brownian motion where the dynamics of the Brownian particle not only depends on the interactions with a thermal environment, but also depends on the state of the internal degrees of freedom of the Brownian particle. Here, we present the microscopic derivation of the OQBM for a Brownian particle with two internal degrees of freedom. Examples of the dynamics for initial Gaussian and non-Gaussian distributions are presented.

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