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Quantum Brownian Motion

Models which contain quantum particle coupled to its environment were analysed many times over recent years or even decades. Nonetheless this old and seemingly well known problem contains some unknown aspects and have not been solved in the general case. Furthermore by analysing behaviour of quantum Brownian motion one could attempt to find answer for many fundamental questions concerning the very essence of the quantum world, investigate transport phenomena or consider the nature and properties of quantum information.
The topic of quantum Brownian motion is fundamental for many fields of physics, for instance in statistical physics, condensed matter and atomic physics.
There are plenty of methods for analysing such systems for instance path integrals method, van Kampen method or generalised Langevin equation method. In our considerations we utilise the last listed method and as a starting point in our analysis we took quantum fluctuation-dissipation theorem.
We would like to present some of interesting properties exhibited by such systems and exact, analytical results which we have obtained. In our investigations we were focused mainly on the kinetic energy of Brownian particle in long-time limit and general formula for autocorrelation function.

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