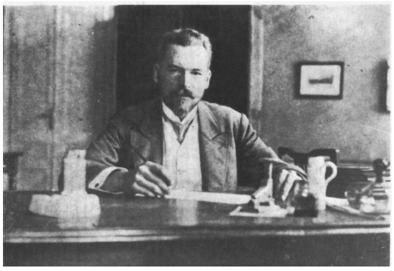

Contribution ID: **56** Type: **poster**

Energy of Quantum Brownian Oscillator

Thursday, 6 September 2018 15:00 (3 hours)

Models which contain quantum particle coupled to its environment were analysed many times over recent years or even decades. This old and seemingly clichéd system-environment model has been re-considered many, many times by each next generation of physicists. However, it is still difficult to find a transparent presentation of this fundamental issue of the quantum statistical physics. 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.
We study the celebrated model of a quantum open system S, i.e. a quantum harmonic oscillator of mass M and eigenfrequency ω_0 . It is in contact with a heat bath B modeled as a collection of independent quantum harmonic oscillators which form thermostat of temperature T being in an equilibrium Gibbs canonical state.

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 for energy - potential and kinetic - which we have obtained.

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Session Classification: Poster session