Quantum analogue of energy equipartition theorem

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One of the fundamental laws of classical statistical physics is the energy equipartition theorem which states that for each degree of freedom the mean kinetic energy equals $E_k = k_B T/2$, where k_B is the Boltzmann constant and T is temperature of the system. Despite the fact that quantum mechanics has already been developed for more than 100 years still there is no quantum counterpart of this result. In my talk I will formulate the quantum analogue of energy equipartition theorem [1] that holds true for all quantum systems which are composed of an arbitrary number of non-interacting or interacting particles subjected to any confining potentials and coupled to thermostat with an arbitrary coupling strength. I will discuss its implication for two paradigmatic, exactly solvable models, namely, a free quantum Brownian particle and a dissipative harmonic oscillator [2-4].

[1] J. Luczka, J. Stat. Phys. 179, 839 (2020)

[2] J. Spiechowicz, P. Bialas, J. Luczka, Phys. Rev. A 98, 052107 (2018)

[3] P. Bialas, J. Spiechowicz, J. Luczka, Sci. Rep. 8, 16080 (2018)

[4] J. Spiechowicz and J. Luczka, Sci. Rep. 11, 4088 (2021)