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Brownian motion in logarithmic potential

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In this thesis we study the first-passage properties in extended many-body non-equilibrium system. We consider the system of Brownian particles, immersed in a space (fluid) under a logarithmic potential field $U(x,t) = g(t)log(x)$. Such a model can describe, for example, interaction among the polyelectrolytic polymers with a time-dependent charge.
Main part of this thesis is devoted to the Brownian motion with the time-dependent potential strength $g(t)$. To obtain the survival probability for this case, one may try to solve the corresponding Fokker-Planck equation. However, its exact solution for the time-dependent potential strength is yet unknown. In this work we suggest a simple asymptotic theory which yields the long-time behavior of the survival probability and the moments of the particle position. Survival probability, as a functional of the potential strength, exhibits a rather various behaviour for different functions $g(t)$. According to this, we restricted three regimes of its asymptotic decay: the regular regime, the marginal regime and the regime of enhanced absorption. In addition, we have also adressed the question of how will the derived first-passage properties of the Brownian motion change when the absorbtion boundary is said to be not exactly at the origin, but at some non-zero a, $a > 0$.

Sekce

Teoretická fyzika

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