Fractal dimension of the trajectory of an active and a passive colloidal particle in plasmas in the numerical simulation

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This work is devoted to study the dynamics of active and passive Brownian particles [1] via the approach proposed in [2]—the computation of the mean first-passage time dynamic entropy (MFPT entropy). With the help of this approach, it is possible to describe the motion of each individual (active or passive) Brownian particle and to compare different modes of motion [3].
Numerical simulations of the dynamics of a single colloidal particle was carried out using different models of motion: ballistic, diffusive and active motion of the colloidal particle were considered. The self-propelled velocity of the particle, the rotational diffusion coeffcient, the ratio of the friction coeffcient and the time step ("camera frequency") were varied; simulation was carried out of a particle on an infinite plane and in a parabolic trap. For each case studied, the dependences of the mean-square displacement on time and the MFPT dynamic entropy on the coarsening parameter were obtained. Comparison with the existing theoretical models is carried out.

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[2] Allegrini P, Douglas J and Glotzer S 1999 *Phys. Rev. E* **60** 5714
[3] Koss X, Kononov E, Lisina I, Vasiliev M and Petrov O 2022 *Molecules* **27** 1614