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Temperature and friction fluctuations inside a harmonic potential

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In this talk we present the study of the trapped motion of a molecule undergoing diffusivity fluctuations inside a harmonic potential. For the same diffusing-diffusivity process, we investigate two possible interpretations. Depending on whether diffusivity fluctuations are interpreted as temperature or friction fluctuations, we show that they display drastically different statistical properties inside the harmonic potential. We compute the characteristic function of the process under both types of interpretations and analyse their limit behavior. Based on the integral representations of the processes we compute the mean-squared displacement and the normalized excess kurtosis. In the long-time limit, we show for friction fluctuations that the probability density function (PDF) always converges to a Gaussian whereas in the case of temperature fluctuations the stationary PDF can display either Gaussian distribution or generalized Laplace (Bessel) distribution depending on the ratio between diffusivity and positional correlation times.

Temperature and friction fluctuations inside a harmonic potential Yann Lanoiselée, Aleksander Stanislavsky, Davide Calebiro, Aleksander Weron (submitted) https://arxiv.org/abs/2207.14068

Primary authors: Dr LANOISELÉE, Yann (University of Birmingham); Dr STANISLAVSKY, Aleksander (Institute of Radio Astronomy, Karkhiv); Prof. CALEBIRO, Davide (University of Birmingham); Prof. WERON, Aleksander (Faculty of Pure and Applied Mathematics, Hugo Steinhaus Center, Wroclaw)

Presenter: Dr LANOISELÉE, Yann (University of Birmingham)

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