Contribution ID: 88

Type: not specified

Work fluctuations in the harmonic Active Ornstein-Uhlenbeck particle model

Tuesday, 20 December 2022 16:25 (20 minutes)

Over the past few years great interest arose in providing a thermodynamic description of Active Matter Systems, a class of non-equilibrium systems in which the single components are able to transform energy into self-propelled motion. A measure of the transformation efficiency is provided by the Active Work performed by active particles. The distribution of such an observable has been object of recent research [1] as possible singularities signal the occurrence of Dynamical Phase Transitions (DPTs) [2,3], in turn related to peculiar trajectory realisations.

In light of this scenario, we focus on a single overdamped harmonically trapped Active Ornstein-Uhlenbeck Particle and provide the analytic expression for the scaled cumulant generating function (SCGF) of the Active Work obtained using the large deviation theory recently developed for quadratic functionals of stable Gauss-Markov chains [4]. Interestingly, we find the SCGF to be non-steep in many physical situations and we provide insight on the effect of relevant system parameters, such as the Peclet number, on the SCGF steepness trough a phase diagram in the system parameter space. Through Legendre-Fenchel transform, the SCGF steepness is shown to lead to singular rate functions with linear tails, and ultimately to the occurrence of DPTs also in this system. We also investigate on the role of initial and final condition in producing the consequent anomalous trajectories.

[1] Semeraro M. et al, J Stat Mech, 2021

[2] Cagnetta F. et al., PRL, 2017

[3] Keta YE. et al., PRE, 2021

[4] Zamparo et al., arXiv, 2022

Primary authors: Dr SUMA, Antonio (Università degli STudi di Bari,INFN - sezione di Bari); Prof. GONNELLA, Giuseppe (Università degli Studi di Bari, INFN - sezione di Bari); Mr SEMERARO, Massimiliano (Università degli STudi di Bari,INFN - sezione di Bari); Dr ZAMPARO, Marco (Università degli STudi di Bari,INFN - sezione di Bari)

Presenter: Mr SEMERARO, Massimiliano (Università degli STudi di Bari,INFN - sezione di Bari)

Session Classification: Session 7 B