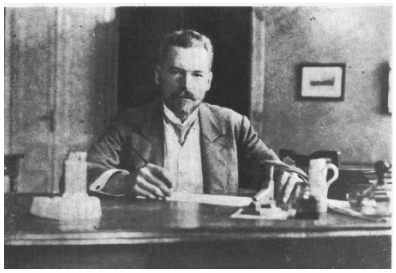

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Giant enhancement of transport induced by active fluctuations via periodic potential

Tuesday, 26 September 2023 16:52 (1 minute)

Understanding the role of active fluctuations in physics is a problem emerging both as a hot topic and a major challenge. The reason for this is their inherent non-equilibrium nature. This feature opens a landscape of phenomena yet to be explored that are absent in the presence of thermal fluctuations alone. Recently a paradoxical effect has been briefly communicated in which a free particle transport induced by active fluctuations in the form of white Poisson shot noise can be enormously boosted when it is additionally subjected to a periodic potential by exploiting relaxation down the potential slope. Here, the original predictions are considerably extended, and the impact of statistics of active fluctuations on the occurrence of this effect is investigated. A toy model of the jump-relaxation process is constructed, which allows for the identification of different transport boost regimes and explanation of their corresponding mechanisms and consequently pinpointing properties of active fluctuations statistics necessary for the effect to occur. The results are relevant not only for microscopic physical systems but also for biological ones such as e.g., living cells where fluctuations generated by metabolic activities are active by default.

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