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Anomalous transport in driven periodic systems: distribution of the absolute negative mobility effect

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Absolute negative mobility is one of the most paradoxical forms of anomalous transport behaviour. At the first glance it contradicts the superposition principle and the second law of thermodynamics, however, its fascinating nature bridges nonlinearity and nonequilibrium state in which these fundamental rules are no longer valid. We consider a paradigmatic model of the nonlinear Brownian motion in a driven periodic system which exhibits the absolute negative mobility. So far research on this anomalous transport feature has been limited mostly to the single case studies due to the fact that this model possesses the complex multidimensional parameter space. In contrast, here we harvest GPU supercomputers to analyze the distribution of negative mobility in the parameter space. We consider nearly 10^9 parameter regimes to discuss how the emergence of negative mobility depends on the system parameters as well as provide the optimal ones for which it occurs most frequently.

Primary authors: WIŚNIEWSKI, Mateusz (University of Silesia in Katowice); Prof. SPIECHOWICZ, Jakub (University of Silesia in Katowice)

Presenter: WIŚNIEWSKI, Mateusz (University of Silesia in Katowice)

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