

Fluctuation relations for anomalous dynamics

Aleksei V. Chechkin¹, Rainer Klages²

¹ *Institute for Theoretical Physics NSC KIPT,*

Akademicheskaya Street 1, Kharkov 61108, Ukraine

² *Queen Mary University of London, School of Mathematical Sciences,*

Mile End Road, London E1 4NS, United Kingdom

We consider work fluctuation relations (FRs) for three generic types of dynamics generating anomalous diffusion: Lévy flights, Gaussian stochastic processes, and time-fractional kinetics. By combining Langevin and kinetic approaches we calculate the probability distributions of mechanical, respectively thermodynamical work in the two paradigmatic nonequilibrium situations of a particle subject to a constant force, and a particle in a harmonic trap dragged by a constant force. We check the transient FR for two models exhibiting superdiffusion, where a fluctuation-dissipation relation does not exist, and for two other models displaying subdiffusion, where there is a fluctuation-dissipation relation. In the two former cases the conventional transient FR is not recovered, whereas in the latter two it holds either exactly or in the long-time limit [1].

[1] A.V.Chechkin, R.Klages, J.Stat.Mech. L03002 (2009).