Dynamic of nonequilibrium processes in the energy presentation

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Stochastic dynamics in the energy representation is used as a method to represent nonequilibrium Brownian-like systems. It is shown that the equation of motion for the energy of such systems can be taken in the form of the Langevin equation with multiplicative noise. Properties of the steady states are examined by solving the Fokker-Planck equation for the energy distribution functions. The generalized integral fluctuation theorem is deduced for the systems characterized by the shifted probability flux operator. From this theorem, a number of entropy and fluctuation relations such as the Evans-Searles fluctuation theorem, the Hatano-Sasa identity, andthe Jarzynskis equality are derived. The main goal of this presentation is to present a simple way to describe non-equilibrium systems in energy space and to obtain new spacial solution. The novelty of this presentation is based on the kinetic equation which may be further used to describe the non-equilibrium systems, as Brownian system in the energy space. We further analyze properties of the stationary steady states and describe several nonlinear models of such systems.

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2. B. I. Lev and A. D. Kiselev, Phys. Rev. E,**82**, 031101 (2010), DOI: 10.1103/PhysRevE.82.031101