Seminario de Mecánica Estadística

Statistical Mechanics of Hamiltonian systems at negative absolute temperature

Marco Baldovin (Univ. La Sapienza, Rome)

Systems at "negative" absolute temperatures (NAT), i.e. systems whose entropy decreases when energy increases, can be found in several research fields: important examples are two-dimensional vortices, nuclear spins and cold atoms. Far from being mere curiosities, NAT states show rather interesting statistical properties, and it is not completely clear, a priori, whether the usual results of classical Statistical Mechanics can be straightforwardly extended to them: a stimulating debate on these topics is still ongoing. Here we are interested in a class of Hamiltonian models with bounded kinetic terms, which can achieve NAT and can be studied through analytical computations and numerical simulations. Our aim is to get a better insight into the properties of NAT states: in particular, well-known results such as the Zero-th Principle, the (in)equivalence of statistical ensembles, response theory, Langevin dynamics and Fluctuation-Dissipation relation are reviewed in this framework.

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