ABSTRACT BOOK

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Experimental verification of optimal finite-time processes with colloidal particles in optical tweezers

Thalyta Tavares Martins[1], Lucas Prado Kamizaki[1] and Sérgio Ricardo Muniz[1]
[1]Instituto de Física de São Carlos, IFSC/USP, [2]Instituto de Física Gleb Wataghin, IFGW

The rising interest in understanding biological system performance and the limits of energetic and informational efficiencies has led to several studies related to processes optimization on small scales. In such systems, the energetic cost of a finite-time protocol depends on the system's trajectory in the phase space and can be minimized for a given set of parameters. Although this optimization can be very complex depending on the chosen platform, there are a few analytical results for colloidal particles trapped in harmonic potentials [1]. This work presents studies to experimentally verify dissipation minimization between different equilibrium states with a dynamically modulated optical tweezer [2]. In particular, two external control parameters are considered: the moving laser and stiffening traps.

References

[1] Schmiedl, T. and Seifert, U. (2007). Optimal finite-time processes in stochastic thermodynamics. Physical review letters, 98(10), 108301.
[2] Martins, T. T. (2019). Aprisionamento óptico de micropartículas e desenvolvimento de potenciais ópticos dinâmicos (Master's dissertation, University of São Paulo), DOI:10.11606/D.76.2019.tde-12092019-141442.

Spectral density line shape of spin-1/2 Ising two-leg ladder with plaquette nteraction and random transverse field

Wescley Luiz de Souza[1,2], Érica de Mello Silva[2] and Paulo Henrique Lana Martins[2]
[1]IFMT Campus Cuiabá - Octayde Jorge da Silva
[2]Universidade Federal de Mato Grosso

Multiple spin couplings have proved to be a key tool in describing the dynamics of quantum magnetic systems. In particular, models with four-spin interactions became of great interest since they have been applied to examine material properties such as superconductivity. In this work, the spin-1/2 Ising two-leg ladder with four-spin plaquette interaction in a random transverse field is investigated by means of the recurrence relations method. The magnetic field satisfies a bimodal probability distribution function. The first four recurrants are determined exactly for the general model, while five exact recurrants are calculated for two particular models as functions of field intensities and their probabilities. Higher-order recurrants are obtained via an extrapolation procedure for both the autocorrelation functions and the spectral densities for longer times and infinite-temperature limit. It is shown that, under disorder, a faster oscillation in the relaxation functions occurs and the spectral densities indicate that the system undergoes a crossover from a central-peak to a collective-mode behavior. The characterization of the spectral lines is studied, showing a predominant Lorentzian behavior in the central body and a Gaussian shape in the tails.

Ergodic-localized transition in disorder-free Heisenberg chain with Dzyaloshinskii-Moriya interaction and transverse field

Érica de Mello Silva[1], Maria Eugênia Silva Nunes[2], Paulo H. L. Martins[1], João A. Plascak[3] and João Florencio[4]
[1]Universidade Federal de Mato Grosso,
[2]Universidade Federal de Ouro Preto,
[3]Universidade Federal de Minas Gerais,
[4]Universidade Federal Fluminense

Spin models in which the many-body localization (MBL) takes place have aroused great interest. Sys-