

Closing event - Summer Training Program: Quantum Matter - Materials & Concepts

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The Loschmidt Echo in two coupled collective spins

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In a seminal work, Peres considered the quantity, now called Loschmidt echo, as a measure of sensibility and reversibility of quantum evolution. For quantum chaotic dynamics the decay of the Loschmidt echo with time can be related to the Lyapunov exponent of the underlying classical system. This relation has mostly been done for systems containing a few degrees of freedom (typically a single particle), where the semi-classical limit is well defined. However, much less is known about the case where many degrees of freedom strongly interact. In this work, it is then studied a generalization of the class of collective spin models given by two coupled collective spins which do exhibit chaos and where many degrees of freedom interact. The Loschmidt echo is calculated and related to the corresponding classical Lyapunov exponent, by means of a new averaging method over perturbations. The parabolic and constant regimes of the exponential decay of the Loschmidt echo for different perturbation strengths are consequently verified.

Presenter: CÂMARA, Rodrigo