

[Talk 14] Irreversibility and the arrow of time in a quenched quantum systems

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Irreversibility is one of the most intriguing concepts in physics. While microscopic physical laws are perfectly reversible, macroscopic average behavior has a preferred direction in time. According to the second law of thermodynamics, this arrow of time is associated with a positive mean entropy production. We discuss the nonequilibrium entropy produced in an isolated spin-1/2 system following fast quenches of an external magnetic field measured using a nuclear magnetic resonance setup. We demonstrate that it is equal to the entropic distance, expressed by the Kullback-Leibler divergence, between a microscopic process and its time reversal.

References:

T. B. Batalhao, A. M. Souza, R. S. Sarthour, I. S. Oliveira, M. Paternostro, E. Lutz, and R. M. Serra, Phys. Rev. Lett. 115 (2015) 190601.