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Nonequilibrium quantum correlations and Leggett-Garg inequalities¹ J.C. CASTILLO, F.J. RODRIGUEZ, L. QUIROGA, Universidad de los Andes — Theoretical guides to test 'macroscopic realism' in condensed matter systems under quantum control are highly desirable. We report the evaluation of Leggett-Garg inequalities (LGI) in an out-of-equilibrium set up consisting in two interacting qubits coupled to independent baths at different temperatures as can occur for two dipolar coupled spins or superconducting qubits in diverse solid-state environments. We find that LGI violations persist for a longer time in a thermal nonequilibrium scenario as compared with similar results at thermodynamic equilibrium. We contrast these findings with the behavior of non-locality-dominated quantum correlation measurements, such as concurrence, between the two qubits under similar temperature gradients.

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