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Testing Time Reversal Symmetry in Artificial Atoms FREDERICO BRITO, Univ de Sao Paulo, FRANCISCO ROUXINOL, MATTHEW LAHAYE, Syracuse University, AMIR CALDEIRA, Universidade Estadual de Campinas —
Over the past several decades, a rich series of experiments has repeatedly verified the quantum nature of superconducting devices, leading some of these systems to be regarded as artificial atoms. In addition to their application in quantum information processing, these "atoms" provide a test bed for studying quantum mechanics in macroscopic limits. Regarding the last point, we present here a feasible protocol for directly testing time reversal symmetry in a superconducting artificial atom. Time reversal symmetry is a fundamental property of quantum mechanics and is expected to hold if the dynamics of the artificial atom strictly follow the Schrödinger equation. However, this property has yet to be tested in any macroscopic quantum system. The test we propose is based on the verification of the microreversibility principle, providing a viable approach to verify quantum work fluctuation theorems - an outstanding challenge in quantum statistical mechanics. For this, we outline a procedure that utilizes the microreversibility test in conjunction with numerical emulations of Gibbs ensembles to verify these theorems over a large temperature range.

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