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Experimental investigation of Demon-like Algorithmic Quantum Cooling and its Applications[1]

CHUAN-FENG LI, University of Science and Tech of China

Simulation of the low-temperature properties of many-body systems remains one of the major challenges in theoretical and experimental quantum information science. Firstly we demonstrate experimentally a Demon-like algorithmic cooling method that is applicable to any physical system that can be simulated by a quantum computer. This method allows us to distil and eliminate hot components of quantum states like a quantum Maxwell's demon. The experimental implementation is realized with a quantum optical network, and the results are in full agreement with theoretical predictions (with fidelity higher than 0.978). Secondly, we use the demon-like algorithmic cooling method to experimentally investigate Majorana zero modes exhibiting a fundamental property of non-Abelian statistics.

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