

# OpenQMBP2023: New perspectives in the out-of-equilibrium dynamics of open many-body quantum systems



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## Magic Phase transition with Random Quantum Circuits

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Magic is a property of quantum states that enables universal fault-tolerant quantum computing using simple sets of gate operations. Understanding the mechanisms by which magic is created or destroyed is, therefore, a crucial step towards efficient and practical fault-tolerant computation. We observe that a random stabilizer code subject to coherent errors exhibits a phase transition in magic, which we characterize through analytic, numeric and experimental probes. Below a critical error rate, stabilizer syndrome measurements remove the accumulated magic in the circuit, effectively protecting against coherent errors; above the critical error rate syndrome measurements concentrate magic. A better understanding of such rich behavior in the resource theory of magic could shed more light on origins of quantum speedup and pave pathways for more efficient magic state generation.

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