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Simulation of an arbitrary quantum channel with minimal ancillary resource CHAO SHEN, KYUNGJOO NOH, VICTOR V. ALBERT, MICHEL H. DEVORET, ROBERT J. SCHOELKOPF, STEVEN M. GIRVIN, LIANG JIANG, Yale University — We discuss an explicit and efficient construction of quantum circuits that can simulate an arbitrary given quantum channel acting on a d-level quantum system, with the minimal quantum ancillary resource—a qubit and its QND readout. The elementary operations required are unitary evolutions and single qubit projective measurement. We further show that this technique opens up exciting new possibilities in the field of quantum control, quantum simulation, quantum error correction, and quantum state discrimination. Our proposal can be implemented on platforms such as a superconducting transmon qubit inside a microwave cavity.

Chao Shen
Yale University

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