

Abstract Submitted
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Quantum Flute: Multimode circuit QED with long-lived 3D cavities RAVI NAIK, SRIVATSAN CHAKRAM, NELSON LEUNG, Physics Department and James Franck Institute, University of Chicago, DAVID MCKAY, IBM T.J. Watson Research Center, TAEKWAN YOON, Department of Applied Physics and Department of Physics, Yale University, PETER GROSZKOWSKI, JENS KOCH, Departments of Physics and Astronomy, Northwestern University, DAVID SCHUSTER, Physics Department and James Franck Institute, University of Chicago — Superconducting microwave cavities have been shown to have very long single-photon lifetimes, making them a valuable resource for quantum computation and simulation. One of the major sources of dissipation in such cavities is loss occurring at the seam between two parts of the cavity, which has resulted in the exploration of seamless designs¹. Here, we present a novel technique for fabricating seamless multimodal cavities, with a variety of mode distributions. We discuss measurements of the quality factors of the cavity modes, as well as schemes for quantum control of the modes using superconducting transmon qubits.

¹M. Reagor, et al., Phys. Rev. B 94, 014506 (2016).

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