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**Tunable 3D cQED: Implementation and Characterization** KEVIN CHOU, MATTHEW REED, NISSIM OFEK, JACOB BLUMOFF, BRIAN VLASTAKIS, GERHARD KIRCHMAIR, Yale University Dept. of Applied Physics, SIMON NIGG, Yale University Dept. of Physics, LUIGI FRUNZIO, Yale University Dept. of Applied Physics, STEVEN GIRVIN, Yale University Dept. of Physics, ROBERT SCHOELKOPF, Yale University Dept. of Applied Physics — Significant progress has recently been made in improving the coherence of superconducting qubits by using the 3D cQED architecture. This current design is static, not allowing for the modulation of couplings and nonlinearities in situ. This limitation may prove to be an obstacle toward scaling this implementation into more complex systems. We present a new architecture which integrates high Q-factor 3D resonators with flux-tunable superconducting transmon qubits. In this talk, we will demonstrate full control over qubit frequency with minimal degradation to qubit and cavity lifetime. This capability allows the rapid and precise control over the system Hamiltonian to choose optimal couplings and nonlinearities as dictated by the experiment.

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