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Tunable coupling in circuit quantum electrodynamics with a superconducting V-system SRIKANTH SRINIVASAN, ANTHONY HOFFMAN, DEVIN UNDERWOOD, Princeton University, JAY GAMBETTA, Institute for Quantum Computing and Department of Applied Mathematics, University of Waterloo, ANDREW HOUCK, Princeton University — We demonstrate a new superconducting charge qubit that realizes a V-shaped energy level spectrum, enabling tunable coupling between the qubit and a superconducting cavity while retaining all of the advantages, including charge noise insensitivity, common to other charge qubits such as the transmon. Tunable coupling is achieved with quantum interference between the two excited states of the qubit. We report measurements of the vacuum Rabi splitting, showing that the coupling strength can be tuned from greater than 40 MHz to less than 200 kHz using fast flux bias lines. This dynamically tunable coupling is an intrinsic property of the qubit and requires no additional coupling circuit elements. This new qubit design shows great promise for future quantum information processing and quantum optics experiments.

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