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Coplanar resonators as computational elements in a superconducting qubit architecture MAX HOFHEINZ, E.M. WEIG, R.C. BIALCZAK, H. WANG, N. KATZ, M. NEELEY, E. LUCERO, A.D. O'CONNELL, M. ANSMANN, J. WENNER, D. SANK, I. STORCH, J.M. MARTINIS, A.N. CLELAND, UC Santa Barbara — We are coupling a superconducting phase qubit, implemented using a current-biased Josephson junction, to a high-Q coplanar waveguide resonator. The interaction between the phase qubit and the resonator can be controlled by tuning the qubit frequency into and out of resonance with the resonator, a tuning that can be achieved dynamically over times short compared to the Rabi time. By combining the quantum control flexibility of the phase qubit with the long coherence time and bosonic nature of the resonator, a number of interesting quantum operations can be explored, including long-term phase coherent quantum memory and two-qubit bus architectures. In this talk we will report on our recent progress with this experiment.

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