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Quantum coherence in a Josephson junction array circuit. VLADIMIR MANUCHARYAN, JENS KOCH, LEONID GLAZMAN, ROBERT SCHOELKOPF, STEVEN GIRVIN, MICHEL DEVORET, Yale Applied Physics — We introduce a novel superconducting quantum electrical circuit where a small capacitance Josephson tunnel junction is shunted by an array of larger junctions to form a loop. The loop is capacitively coupled to a microwave transmission line resonator in order to perform a dispersive readout of the qubit state. The low-lying energy states of such circuit belong to the microwave band and tune with magnetic flux threading the loop. Our circuit differs significantly from the well-established charge, flux and phase qubit circuits. Namely, while staying highly anharmonic, the energy spectrum is neither sensitive to the offset charges nor it is exponentially sensitive to the junction parameters or flux bias. We demonstrate experimentally strong coupling to the readout resonator, map the spectrum over wide range of bias fluxes and frequencies and observe coherence times in excess of one microsecond.

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