Abstract Submitted
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Tunable resonant and non-resonant interactions between a phase qubit and LC resonator[1] MICHAEL SHANE ALLMAN, JED D. WHITTAKER, MANUEL CASTELLANOS-BELTRAN, KATARINA CICAK, FABIO DA SILVA, MICHAEL DEFEO, FLORENT LECOCQ, ADAM SIROIS, JOHN TEUFEL, JOSE AUMENTADO, RAYMOND W. SIMMONDS, NIST - Boulder — We use a flux-biased radio frequency superconducting quantum interference device (rf SQUID) with an embedded flux-biased direct current (dc) SQUID to generate strong resonant and non-resonant tunable interactions between a phase qubit and a lumped-element resonator. The rf-SQUID creates a tunable magnetic susceptibility between the qubit and resonator providing resonant coupling rates from zero to near the ultra-strong coupling regime. By modulating the magnetic susceptibility, non-resonant parametric coupling achieves rates $> 100\,\mathrm{MHz}$. Nonlinearity of the magnetic susceptibility also leads to parametric coupling at subharmonics of the qubit-resonator detuning. Controllable coupling is generically important for constructing coupled-mode systems ubiquitous in physics, useful for both, quantum information architectures and quantum simulators.

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