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Improving Superconducting Qubit Lifetimes with Broadband Filters[1] NICHOLAS BRONN, ANTONIO CORCOLES, JARED HERTZBERG, SRIKANTH SRINIVASAN, JERRY CHOW, JAY GAMBETTA, MATTHIAS STEFFEN, IBM TJ Watson Research Center, YANBING LIU, ANDREW HOUCK, Princeton University — In circuit quantum electrodynamics, the state of the qubit is read out via a resonator at a different frequency than that of the qubit. Spontaneous qubit decay via the resonator may be suppressed by engineering an impedance mismatch at the qubit frequency, while still allowing a large coupling between the resonator and external environment necessary for fast, high fidelity readout. We present a stepped-impedance filter with a large stop-band in the qubit frequency range and demonstrate its effect on qubit lifetime. This filter is also effective when used in an off-chip geometry.

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Nicholas Bronn
IBM TJ Watson Research Center

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