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Measuring the environmental impedance of the Cooper-pair box BENJAMIN TUREK, JOHANNES MAJER, JOHN TEUFEL, Yale University, AASHISH CLERK, McGill University, STEVEN GIRVIN, ROBERT SCHOELKOPF, Yale University — The Cooper-pair box qubit measured by the SET can have long decoherence times that are limited by the quantum noise of the environment. Qubits fabricated at Yale are designed with 50 ohm transmission lines that control this environmental impedance to very high frequencies. We use the AC Josephson effect of a hysteretic DC-Squid to measure the frequency dependence of this impedance. At frequencies where the real part of the environmental impedance is large, the AC Josephson effect causes the small-junction analogue of self-induced Shapiro steps in the IV curves of a DC Squid [T. Holst et al., PRL 73, 3455 (1994)]. We determine that the environmental impedance of our qubit is well behaved at frequencies less than 20 GHz.

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