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In situ variation of the coupling of a dc SQUID phase qubit to its bias leads[1] HANHEE PAIK, S.K. DUTTA, R.M. LEWIS, T.A. PALOMAKI, B.K. COOPER, A.J. PRZYBYSZ, HYEOKSHIN KWON, A.J. DRAGT, J.R. ANDERSON, C.J. LOBB, F.C. WELLSTOOD, Center for Superconductivity Research and Joint Quantum Institute, Department of Physics, University of Maryland — In dc SQUID phase qubit[1], one junction ($Al/Al_2O_3/Al$ or $Nb/Al_2O_3/Nb$) acts as an ideal phase qubit and the rest of the SQUID which includes a second junction acts as an inductive isolation network. The Josephson inductance of the isolation junction was varied by changing its bias current, allowing in situ control of the coupling between the qubit junction and the leads. Measurements of the tunneling escape rate showed excess tunneling events due to high-frequency noise exciting the qubit junction out of the ground state $|0\rangle$. The impedance of the isolation junction becomes infinite at its resonance frequency where the isolation fails and the isolation network lets noise in to the qubit junction. Analysis of the data taken at 80 mK reveals that excess tunneling was largest when the $|0\rangle$ to $|1\rangle$ resonance frequency (10 to 15 GHz) of the isolation junction equaled the $|0\rangle$ to $|2\rangle$ or the $|1\rangle$ to $|3\rangle$ transition frequency of the qubit junction. [1] J. M. Martinis, et al. Phys. Rev. Lett. 89, 117901 (2002)

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