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Suppressing Leakage in High Fidelity Single Qubit Gates for Superconducting Qubits[1] Z. CHEN, J. KELLY, C. QUINTANA, UC Santa Barbara, R. BARENDS, Google, Santa Barbara, B. CAMPBELL, UC Santa Barbara, Y. CHEN, Google, Santa Barbara, B. CHIARO, A. DUNSWORTH, UC Santa Barbara, A.G. FOWLER, E. LUCERO, E. JEFFREY, A. MEGRANT, J. MUTUS, M. NEELEY, Google, Santa Barbara, C. NEILL, P.J.J. O'MALLEY, UC Santa Barbara, P. ROUSHAN, D. SANK, Google, Santa Barbara, A. VAINSENCHER, J. WENNER, T. WHITE, UC Santa Barbara, A.N. KOROTKOV, UC Riverside, J.M. MARTINIS, UC Santa Barbara and Google, Santa Barbara — Recent results show that superconducting qubits are approaching the threshold for fault tolerant quantum error correction. However, leakage into non-qubit states remains a significant hurdle because leakage errors are highly detrimental for error correction schemes such as the surface code. I will demonstrate that with a simple addition to DRAG pulse shaping, leakage can be suppressed to the 10^{-5} level while simultaneously maintaining 10^{-3} gate fidelity. I will also show that the remaining leakage errors are due to heating of the qubit, suggesting further avenues for improvement.

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