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Analytic approach for suppressing leakage errors in superconducting qubits HUGO RIBEIRO, ALEXANDRE BAKSIC, AASHISH CLERK, McGill University — The problem of leakage errors is generic to a variety of situations in quantum information processing. The most prominent example is the problem of high-fidelity qubit gates: control sequences designed to implement a given unitary operation will in general give rise to undesirable transitions out of the logical subspace. Here, we present a new and extremely general strategy based on the Magnus expansion to suppress leakage errors [1]. By correcting control pulses, we modify the Magnus expansion of an initially-given, imperfect unitary gate in such a way that the desired leakage-free evolution is obtained. While our method can be applied to a variety of different problems (e.g. correcting non-adiabatic errors in adiabatic evolution), in this talk we focus on demonstrating how the method can be used to correct leakage in single and two-qubit gates.
[1]H. Ribeiro, A. Baksic, and A. A. Clerk, ArXiv e-prints (2016), arXiv:1610:01105 [quant-ph].

Hugo Ribeiro
McGill University

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