

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Analytic control methods for high fidelity unitary operations in a weakly nonlinear oscillator SETH MERKEL, JAYDE GAMBETTA, FELIX MOTZOI, FRANK WILHELM, University of Waterloo — In qubits made from a weakly anharmonic oscillator the leading source of error at short gate times is leakage of population out of the two dimensional Hilbert space that forms the qubit. In this talk we explore a general technique based on an adiabatic expansion to find pulse shapes that correct this type of error. This leads to a family of solutions that can be further refined based on what is feasible for a particular application. This set of pulses contains and improves upon the previously developed DRAG solution [F. Motzoi, et. al., Phys. Rev. Lett. 103, 110501 (2009)] and can be further generalized to more complicated systems with additional leakage channels.

Seth Merkel
University of Waterloo

Date submitted: 21 Nov 2010

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