Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Robust optimal quantum gates for Josephson charge qubits SIMONE MONTANGERO, NEST-CNR-INFM & Scuola Normale Superiore, P.zza dei Cavalieri 7, Pisa, Italy, TOMMASO CALARCO, ITAMP, Harvard University, Cambridge, MA 02138, U.S.A., ROSARIO FAZIO, NEST-CNR-INFM & Scuola Normale Superiore, P.zza dei Cavalieri 7, Pisa, Italy — Quantum optimal control theory allows to design accurate quantum gates. We employ it to design high-fidelity two-bit gates for Josephson charge qubits in the presence of both leakage and noise. Our protocol considerably increases the fidelity of the gate and, more important, it is quite robust in the disruptive presence of 1/f noise. The improvement in the gate performances discussed in this work (errors $\sim 10^{-3} \div 10^{-4}$ in realistic cases) allows to cross the fault tolerance threshold.

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Date submitted: 23 Nov 2007 Electronic form version 1.4