

Abstract Submitted  
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**Non-Adiabatic Holonomic Quantum Gates in an atomic system**

VAHID AZIMI MOUSOLOU, CARLO M. CANALI, School of Computer Science, Physics and Mathematics, Linnaeus University, Kalmar, Sweden, ERIK SJOQVIST, Department of Quantum Chemistry, Uppsala University, Uppsala, Sweden — Quantum computation is essentially the implementation of a universal set of quantum gate operations on a set of qubits, which is reliable in the presence of noise. We propose a scheme to perform robust gates in an atomic four-level system using the idea of non-adiabatic holonomic quantum computation proposed in [1]. The gates are realized by applying sequences of short laser pulses that drive transitions between the four energy levels in such a way that the dynamical phases vanish.

[1] E. Sjoqvist, D.M. Tong, B. Hessmo, M. Johansson, K. Singh, arXiv:1107.5127v2 [quant-ph]

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