Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Optimizing Quantum Adiabatic Algorithm HONGYE HU, BIAO WU, Peking Univ — In quantum adiabatic algorithm, as the adiabatic parameter $s(t)$ changes slowly from zero to one with finite rate, a transition to excited states inevitably occurs and this induces an intrinsic computational error. We show that this computational error depends not only on the total computation time T but also on the time derivatives of the adiabatic parameter $s(t)$ at the beginning and the end of evolution. Previous work (Phys. Rev. A 82, 052305) also suggested this result. With six typical paths, we systematically demonstrate how to optimally design an adiabatic path to reduce the computational errors. Our method has a clear physical picture and also explains the pattern of computational error. In this paper we focus on quantum adiabatic search algorithm although our results are general.

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Date submitted: 05 Nov 2015 Electronic form version 1.4