

Abstract for an Invited Paper
for the DAMOP05 Meeting of
The American Physical Society

Efficient quantum computation with probabilistic gates and its applications in implementation

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With a combination of the quantum repeater and the cluster state approaches, we show that efficient quantum computation can be constructed even if all the entangling quantum gates only succeed with an arbitrarily small probability p . The required computational overhead scales efficiently both with $1/p$ and n , where n is the number of qubits in the computation. This approach provides an efficient way to combat noise in a class of quantum computation implementation schemes, where the dominant noise leads to probabilistic signaled errors with an error probability $1-p$ far beyond any threshold requirement. In particular, I will show two implementation schemes based on the atom-photon interaction where the above result plays a critical role.