



PHYSICS AND ASTRONOMY COLLOQUIUM

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Robustness of Adiabatic Quantum Computation against Decoherence

Abstract

Decoherence is widely regarded as the most significant obstacle in the development of quantum computers. Without complex and costly error correction schemes, most forms of quantum computation must be completed within a short decoherence time, significantly limiting their applicability. Adiabatic quantum computation (AQC), however, is a quantum computation scheme that is believed to be more robust against decoherence. In this talk, I will start by introducing AQC as a scheme for quantum computation, with an emphasis on its inherent tolerance towards environmental noise. I then demonstrate a hardware implementation of AQC using superconducting flux qubits, and present experimental results from the operation of a 16 qubit block of a 128-qubit superconducting quantum processor. The results show not only tolerance against environmental noise, but also significant enhancement of performance from weakly coupling to a thermal environment. All results are shown to be in close agreement with open quantum mechanics predictions.

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3:30 p.m.

Bob Wright Centre

Room A104