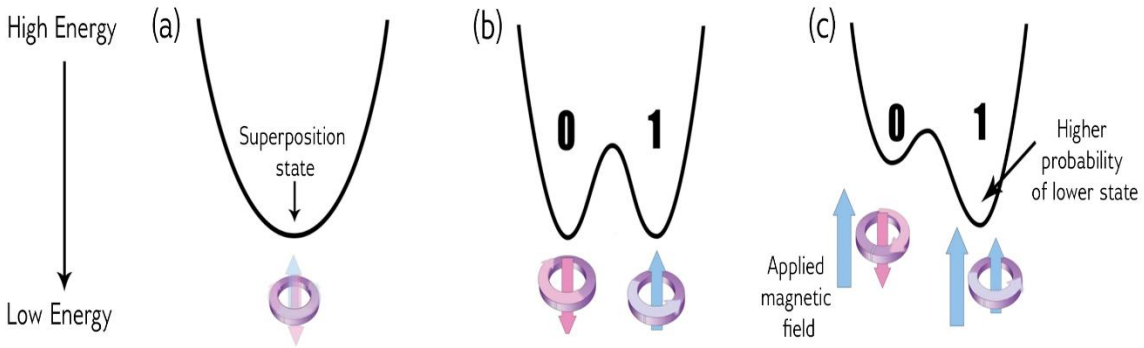
COLLOQUIUM



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Progress towards long range, coherent coupling in Quantum Annealing processors

Abstract

Quantum Annealing is emerging as a viable paradigm for quantum computation for near future pre-error correction processors. As these devices scale in qubit number and physical size, it will become necessary to develop methods for highly connective, coherence preserving, long range qubit interactions. One proposal to implement interactions that meet these criteria is by using gapped spin systems as the signal medium. These spin systems, when tuned to the vicinity of a quantum phase transition, are believed to support long range correlations in a highly entangled ground state. In an effort towards demonstrating long range qubit interactions of this type, we have designed, fabricated, and characterized a one dimensional spin chain comprised of tunable rf-SQUIDs connecting two distantly located superconducting flux qubits.

In this talk, I will review some general features of quantum computing, in particular Quantum Annealing, and how these protocols can be implemented on superconducting Josephson devices. I will present our results probing the response function of the coupler chain as well as demonstrating long range interactions between the two distantly located flux qubits. This work was done as part of the IARPA/DARPA QEO/QAFS program tasked with exploring uses and implementations of more coherent Quantum Annealing platforms. Finally, I will also provide a brief overview of some of the interesting experimental work being performed across this partnership.

3:00 p.m. – 4:00 pm Friday, November 20th Virtual

For Zoom Link contact dougs@mail.fresnostate.edu