

Day 1

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Title: Kirchhoff's Laws as a Classical Model for Superconducting Annealing: Successes and Opportunities

Abstract:

To design operational classical digital superconducting circuits engineering design tools utilize Kirchhoff's Laws which capture the classical circuit dynamics of charge and flux. These equations of motion can be derived from Hamilton's equations and provide a natural classical model for the quantum dynamics of superconducting circuits. Although this model is a canonical one, published works have not previously utilized it as a classical model for quantum superconducting annealing circuits. This talk presents a comparison between this classical model and experimentally reported annealing dynamics, showing qualitative agreement for key experimental properties such as how the probability of finding the ground state depends on temperature, establishing the model as a critical benchmark with which to understand annealing processor behavior. Initial studies within the classical framework show promising performance indicating that, even operating in the classical regime, future superconducting annealing circuits compatible with advanced annealing protocols may provide an important computational resource.