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Tunable Josephson junction arrays as quantum simulators: the example of the tricritical Ising model

Abstract

In the last years, the development of Josephson junction arrays based on hybrid superconductor – semiconductor devices allowed us to reach a remarkable level of control of their main physical parameters. In this talk I will introduce the basic features of these platforms; I will present the analogy of these systems with trapped ultracold bosons and discuss how these solid-state setups can be used as analog quantum simulators. Then, I will focus on the example offered by the design of a specific model, based on a ladder geometry of Josephson junctions, that allows for the exploration of the physics of the tricritical Ising model. This is the simplest example of conformal field theory beyond Ising. I will discuss the building blocks necessary for its quantum simulation, the underlying field theory, and I will show tensor-network results which confirm the emergence of a tricritical Ising point in this Josephson junction system.



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