PHYSICS
COLORADO STATE UNIVERSITY

CSU PHYSICS COLLOQUIUM

Designing Quantum Matter with Superconducting Nanowires

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120 Engineering (Hammond Auditorium)

Abstract

Superconducting nanowires are an experimental realization of a model quantum system that features collective degrees of freedom and exhibits a host of non-equilibrium and non-local phenomena. The nature of the quantum states in nanowires is particularly sensitive to size and shape quantization, coupling with the environment and proximity effects. I will demonstrate how we can utilize these features to tailor the quantum states in nanowires in desirable ways.

Specifically for this purpose, we have developed a unique nanoprinting method for fabrication of ultranarrow nanowires with unprecedented control over their physical texture and their transport properties. I will show how short nanowires exhibit a tunable vortex-in-a-box blockade phenomenon, and how tunable interfaces with graphene and topological insulators lead to unusual properties. Finally, I will discuss the bigger picture for how the texture of the superconducting wavefunction can be precisely controlled by the size, shape, magnetic field and tunable interfaces with materials that exhibit unconventional order, spin texture or topological properties.