

Theory Colloquium

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“Quantum Synchronization in Condensed Matter Systems”

Abstract

Synchronization is one of the most striking manifestations of collective behavior out of equilibrium: a simple yet powerful form of self-organization in which order emerges spontaneously without any leader or external cue. With recent developments in quantum technology that allow one to exquisitely tailor both system and environmental properties, synchronization has also emerged in the quantum domain, attracting considerable interest from both fundamental and applied perspectives. In this talk, I will discuss how condensed matter physics and quantum synchronization can be combined to realize novel forms of collective behavior, including topological synchronization, which connects topological notions with collective dynamics, and synchronized Aharonov–Bohm motifs, where quantum interference and engineered dissipation cooperate. These examples demonstrate that the strategic use of dissipation can serve as a powerful tool to generate nontrivial nonequilibrium many-body dynamics, here viewed through the lens of synchronization.

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SR 1 | ICT building