universität innsbruck

Department of
Theoretical Physics

Theory Colloquium

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"Non-equilibrium as a resource: Non-thermal steady-states of cavity-quantum-materials"

Abstract

Coupling a system to two different baths can lead to novel phenomena escaping the constraints of thermal equilibrium. In quantum materials inside optical cavities, this feature can be exploited as electrons and cavity-photons are easily pulled away from their mutual equilibrium, even in the steady state. This offers new routes for a non-invasive control of material properties and functionalities.

Motivated by recent experimental puzzles arising with transition-metal-dichalcogenides inside Fabry-Perot cavities, we show how the absence of thermal equilibrium between electrons and photons leads to qualitative modifications of the material's properties in two different ways: 1) the standard Sommerfeld expansion for observables near the Fermi surface is modified by a leading order correction linearly proportional to the temperature difference as opposed to the thermal quadratic law; 2) the dynamical component of the photon-mediated interaction between electrons is drastically enhanced and strongly depends on the electron lifetime as well as the photon quantum state.

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SR 1 | ICT building