UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

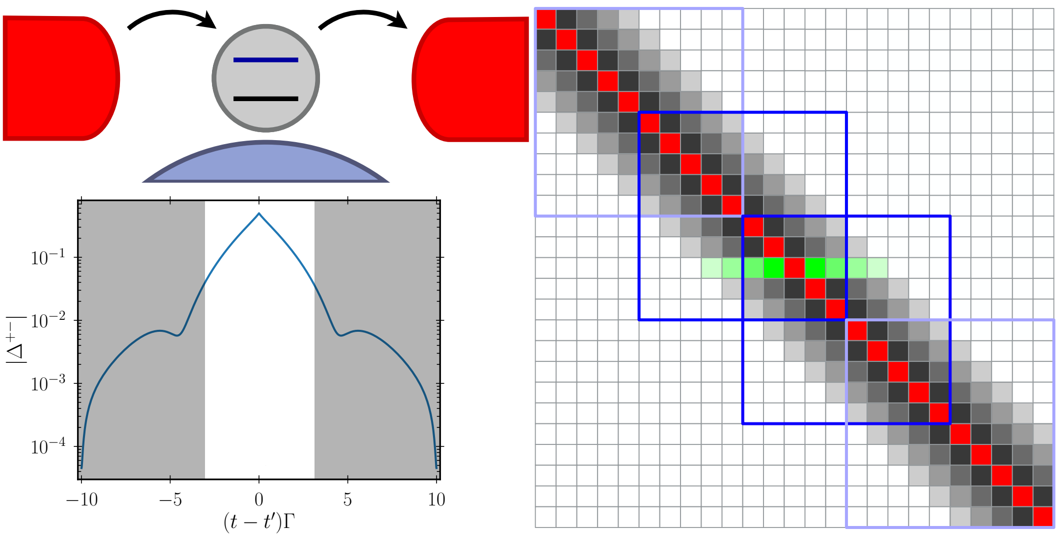
Theorie-Kolloquium SS 2021
Fr 18.06.2021, 12:00-13:30
Online (URL in E-Mail)

udue.de/TheoKoll

Resonant Transport through Quantum-Dot Systems: Path-Integral Summations

Dr. Simon Mundinar

UDE



Quantum-dot systems are highly tunable setups, that can find applications in single-electron transistors or spin valves. Significant efforts have been made to understand the electronic transport properties of these systems. A common approximation within these studies is that the quantum-dot is only coupled weakly to its leads, allowing for a perturbation series in the tunnel coupling. This method, however, neglects by design resonant tunneling effects, making it blind to non-perturbative effects, and often only allowing for a qualitative description.

In this talk, we make use of the method of Iterative Summations of Path Integrals (ISPI), a numerically exact method that is based on the truncation of lead-induced correlations. We develop this method further and demonstrate that it can be mapped to a transfer-matrix approach, which not only drastically increases computational performance, but also works in the stationary limit by construction. We employ the ISPI method to study three different quantum-dot systems: (i) the Anderson model, (ii) a quantum-dot spin valve and (iii) a hybrid setup, where the quantum dot is coupled to one superconducting lead, while a normal metal lead acts as a probe.