Physikalisches Institut
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Albert-Ludwigs-Universität Freiburg

QE

# Quantum Efficiency Seminar und Colloquium


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## Scattering Phase of Quantum Dots: Emergence of Universal Behavior


Quantum mechanics fundamentally differs from classical mechanics in that time evolutions are determined by complex probability amplitudes, instead of real probabilities. The quantum phase is a key element to understand mesoscopic transport experiments on Aharonov-Bohm conductance oscillations, weak localization, and conductance fluctuations. While transport measurements are not able to directly measure scattering phases, phase-sensitive experiments have been performed by embedding a quantum dot in one arm of an interferometer. These experiments have observed in-phase behavior between consecutive resonance peaks, whose explanation has remained as a puzzle for more than a decade.

We provide a solution of this puzzle by identifying the role of wave-function correlations existing in chaotic ballistic quantum dots operating in the Coulomb-blockade regime. We show that large universal sequences of in-phase resonances emerge in the short wavelength limit.

Our results are corroborated by numerics and are in qualitative agreement with existing experiments. We consider the constant charging energy description of the Coulomb blockade and we then go beyond mean-field by including the effect of electronic correlations. We demonstrate that the latter do not alter the general picture of the simpler description in the transition between the mesoscopic and universal regimes for the behavior of the scattering phase.


**Date:** **Tuesday, June 5th, 2012 15:45 pm**
**Location:** **Lecture Hall 1, Hermann-Herder-Str. 3, Freiburg**


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