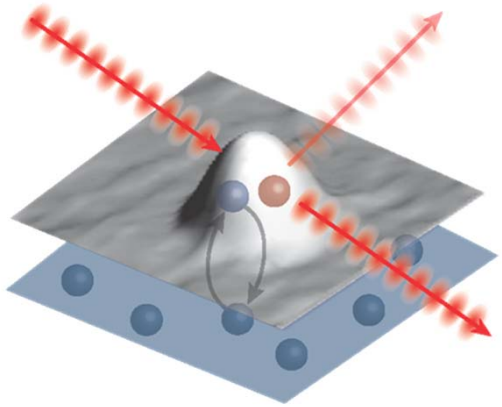
Physikalisches Kolloquium

Universität Konstanz

Di 08.01.19
15:15 Uhr
14:45 Uhr, Kaffee/Tee
R 513

Prof. Dr. Axel Lorke
Faculty of Physics and CENIDE
University of Duisburg-Essen

How to watch a single electron do a quantum jump



Quantum dots are small semiconductor structures, - small enough so that electrons inside them will be confined to their quantum mechanical ground states. They have long been ideal model systems to study the dynamics of single electrons and their interaction with other charge carriers. As such, they have often been labeled “artificial atoms”, and many of the phenomena, known from atomic and molecular physics have been replicated in quantum dots - however, on a completely different length scale and with the tunability that semiconductor nanotechnology offers. In the past, the approaches to study quantum dots were largely separated into two separate fields, namely optical and transport spectroscopy.
In this talk, the atom-like structure and basic quantum properties of self-assembled quantum dots will reviewed. Recent developments will be presented that make it possible to investigate the non-equilibrium dynamics of carriers, injected into excited electronic states. Making use of a combination of optical and transport spectroscopy, it will be shown how it is possible to “watch” (by optical means) individual quantum events of single electrons, tunneling into and out of a quantum dot. The resulting random telegraph signal can be statistically evaluated to reveal both equilibrium and non-equilibrium properties.