

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Charge Fluctuations in a Nanoscale Structure: Interplay of Kondo and Luttinger Liquid Physics PAATA KAKASHVILI, Chalmers University of Technology, HENRIK JOHANNESSON, Göteborg University — We propose a setup which allows to study the interplay of Kondo and Luttinger liquid physics. It consists of a quantum box, biased by a gate voltage, and side-coupled to a quantum wire by a point contact. Close to the degeneracy points of the Coulomb blockaded box the setup can be described as a Luttinger liquid interacting with an effective Kondo impurity. By applying a magnetic field one drives the system from an effective two-channel to a one-channel situation, allowing for the study of the crossover between the two. Using bosonization and boundary conformal field theory we predict that for the case of spin-polarized electrons the differential capacitance of the box will exhibit distinctive Luttinger liquid scaling with temperature and gate voltage. In the limit of zero field the Luttinger liquid behavior gets masked by two-channel Kondo screening, leading to a logarithmic scaling of the differential capacitance with temperature and gate voltage. These effects should be possible to study experimentally using the recently developed SET electrometer technique.

Henrik Johannesson
Göteborg University

Date submitted: 03 Dec 2005

Electronic form version 1.4