

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/20251> holds various files of this Leiden University dissertation.

Author: Kumar, Manohar

Title: A study of electron scattering through noise spectroscopy

Issue Date: 2012-12-05

Propositions

accompanying the dissertation

A STUDY OF ELECTRON SCATTERING THROUGH NOISE SPECTROSCOPY

by

Manohar KUMAR

1. Inelastic vibronic scattering is observed more prominently in electronic shot noise measurements than in differential conductance measurements (Chapter 4 of this thesis).
2. Preliminary measurements on strained Au atomic chains show evidence for a quadratic deviation of the noise above the vibronic energy. This may be due to a feedback of vibronic fluctuations on the statistics of electrons traversing the atomic chain. (Chapter 4 of this thesis).
3. Some Au atomic chain configurations with exceptionally low transmission exhibit a large reduction of shot noise at bias voltages above the vibron energy. These observations cannot be explained in terms of a two-electron-vibron scattering process (Chapter 5 of this thesis).
4. Against expectations based on detailed computational models, experiment shows no evidence for strong itinerant magnetic order in Pt atomic chains. (Chapter 6 of this thesis).
5. Kondo scattering and two-level systems can give rise to similar low-bias conductance and noise properties in atomic contacts. High-bias shot noise measurements should be able to differentiate between the two.
6. The observation of satellite peaks at the vibronic energy, along with a zero-bias peak, in the differential conductance can form a signature of Kondo scattering, provided $T_K/T_{K_S} = 2/3$, where T_K and T_{K_S} are the Kondo temperatures as obtained from Lorentzian fits to the zero-bias peak and satellite peaks, respectively (*Phys. Rev. B* **85**, 125434 (2012)).

7. The regular structural evolution observed when breaking ferromagnetic atomic contacts of Fe and Ni in mechanical controllable break junctions, as reported by Halbritter *et al.*, may not be as general as suggested. (*Phys. Rev. Lett.* **105**, 266805 (2010)).
8. Intra-atomic exchange interaction suppresses atomic chain formation in ferromagnetic atomic contacts. The addition of small molecules, such as hydrogen, could promote chain formation in such atomic contacts by reducing this exchange interaction (*Phys. Rev. Lett.* **103**, 217201 (2009) and Manohar Kumar, unpublished).
9. Integration between nations of the European Union could be stimulated by organizing soccer matches between teams representing the United States and the European Union.
10. A highly connected society makes individuals lonelier.