Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Hierarchical Equation of Motion Investigation of Decoherence and Relaxation Dynamics in Nonequilibrium Transport through Interacting Quantum Dots[1] RAINER HARTLE, Institut fur theoretische Physik, Georg-August-Universitat Gottingen, Germany, GUY COHEN, DAVID R. REICHMAN, Department of Chemistry, Columbia University, ANDREW J. MILLIS, Department of Physics, Columbia University — A recently developed hierarchical quantum master equation approach [1,2] is used to investigate nonequilibrium electron transport through an interacting double quantum dot system in the regime where the inter-dot coupling is weaker than the coupling to the electrodes. The corresponding eigenstates provide tunneling paths that may interfere constructively or destructively, depending on the energy of the tunneling electrons [3]. Electron-electron interactions are shown to quench these interference effects in bias-voltage dependent ways, leading, in particular, to negative differential resistance, population inversion and an enhanced broadening of resonances in the respective transport characteristics [2]. Relaxation times are found to be very long, and to be correlated with very slow dynamics of the inter-dot coherences (off diagonal density matrix elements). The ability of the hierarchical quantum master equation approach to access very long time scales is crucial for the study of this physics. [1] JCP 128, 234703 (2008) [2] arXiv:1309.1170 (2013) [3] PRB 87, 085422 (2013)

[1]This work is supported by the National Science Foundation (NSF DMR-1006282 and NSF CHE-1213247), the Yad Hanadiv-Rothschild Foundation (via a Rothschild Fellowship for GC) and the Alexander von Humboldt Foundation (via a Feodor Lynen fellowship for RH).

Rainer Hartle
Institut fur theoretische Physik, Georg-August-Universitat Gottingen

Date submitted: 12 Nov 2013 Electronic form version 1.4