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Numerical study of interacting systems driven by a constant electric field JANEZ BONCA, J. Stefan Institute, 1000 Ljubljana, Slovenia and FMF, University of Ljubljana, 1000 Ljubljana, Slovenia, LEV VIDMAR, J. Stefan Institute, 1000 Ljubljana, Slovenia, MARCIN MIERZEJEWSKI, Institute of Physics, University of Silesia, 40-007 Katowice, Poland, PETER PRELOVSEK, J. Stefan Institute, 1000 Ljubljana, Slovenia and FMF, University of Ljubljana, 1000 Ljubljana, Slovenia, STUART TRUGMAN, Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA — I will present a fundamental study of a Holstein polaron in one dimension and a single hole in the two dimensional t-J model driven away from the equilibrium by a constant electric field. Taking fully into account quantum effects we follow the time-evolution of systems from their ground state as the constant electric field is switched on at t=0, until they reach a steady state. At small electron phonon coupling (EP) the Holstein polaron experiences damped Bloch oscillations (BO) characteristic for a free electron band. An analytic expression of the steady state current is proposed in terms of EP coupling and electric field. We as well analyze the shape of the phonon tail that forms behind the traveling polaron. In the case of the t-J model we demonstrate that there exist three distinct regimes of the electric field (adiabatic, dissipative and the BO regime) which differ with respect to the real-time response. The d.c. current is shown to be maximal for a finite value of the electric field.

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