MAR15-2014-020387

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Thermalization and long-time behavior of nonequilibrium correlated quantum systems[1]

HERBERT F. FOTSO, Ames Laboratory

Nonequilibrium dynamical mean field theory and nonequilibrium self-consistent strong coupling expansion[1] are used to study the relaxation of correlated quantum systems driven out of equilibrium by DC electric fields[2]. Both the Falicov-Kimball and the Hubbard model are found to exhibit regimes of monotonic or oscillatory themalization as well as regimes where they evolve in a monotonic or oscillatory manner towards a non-thermal state. This suggests that driven quantum systems have a richer behavior than their quenched counterparts and that integrability does not play as critical a role. In the monotonic thermalization scenario, the system evolves through successive quasi-thermal states and it is possible to extrapolate its long time properties from its transient; bridging the gap between the transient and the steady state with very little computational cost. Furthermore, regardless of the relaxation scenario, it is interesting to ask how the particles are distributed as the system evolves in time. We will show that non-trivial parameter-dependent patterns are formed when the system is visualized in momentum space [3]. These features should be observable in current cold atom experiments.

[1] K. Mikelsons, J. K. Freericks, and H. R. Krishnamurthy, Phys. Rev. Lett. 109 260402 (2012).
[2] H. Fotso, K. Mikelsons and J. K. Freericks, Scientific Reports 4, 4699 (2014).
[3] H. Fotso, J. Vicente and J. Freericks, arXiv:1310.6350.

[1]This work was supported by the National Science Foundation under Grant No DMR-1006605 and by the Air Force Office of Scientific Research under the MURI program grant No. FA9559-09-1-0617.