Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter

June 4th 2015 – 16:45

CFEL Seminar room IV, 01.111 (Bldg. 99)

Hugo Strand

University of Fribourg

Real-time dynamics of lattice bosons from nonequilibrium dynamical mean-field theory

We extend bosonic dynamical mean-field theory to nonequilibrium situations in combination with a Nambu strong coupling impurity solver [1]. As a first application we study bosonic cold-atoms in an optical lattice using the Bose-Hubbard model, investigating the Mott insulating, superfluid and normal phases at finite temperatures. We perturb the system by quenching the interaction, mimicking the seminal experiment of Greiner et al. [2], and study its time-evolution. Starting from both the normal and superfluid phase, we map out nonequilibrium phase diagrams of the different dynamical regimes, such as rapid thermalization, and trapping in meta-stable normal and superfluid states. Depending on parameters, the condensate displays long lived or strongly damped amplitude oscillations. Nonequilibrium bosonic dynamical mean-field theory can directly be extended to nonequilibrium bosonic multi-component systems [3] and Bose-Fermi mixtures [4].

1. H. U. R. Strand, M. Eckstein, P. Werner, PRX 5, 011038 (2015)
2. M. Greiner, O. Mandel, T. W. Hansch, I. Bloch, Nature 419, 51 (2002),
3. A. Hubener, M. Snoek, W. Hofstetter, PRB 80, 245109 (2009),
4. P. Anders, P. Werner, M. Troyer, M. Sigrist, L. Pollet, PRL 109, 206401 (2012)

Host: Martin Eckstein

MAX-PLANCK-GESELLSCHAFT