

# Stochastic field equations for a finite Bose gas

Sigmund Heller

Physikalisches Institut Universität Freiburg, Germany

Based on the P-representation of the grand canonical and, more remarkably, the canonical density operator of a Bose field, we introduce corresponding stochastic field equations. Although strictly valid for non-interacting Bosons, we may include a mean-field interaction to describe the behaviour of weakly interacting Bose gases at finite temperature. The usual (classical) thermal field state based on the Gross-Pitaevskii energy functional is obtained in the infinite-temperature limit. Nicely, our quantum field equations do not suffer from cutoff problems which is reflected by spatial correlations of the driving thermal noise. We present numerical simulations for various applications - mainly in the non-interacting regime.