Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Time-dependent restricted-active-space self-consistent-field theory for bosonic many-body systems[1] CAMILLE LEVEQUE, LARS BOJER MADSEN, Aarhus University — We have developed an *ab-initio* time-dependent wavefunction based theory for the description of many-body systems of bosons. The theory is based on a configurational interaction *Ansatz* for the many-body wavefunction with time-dependent self-consistent-field orbitals. The active space of the orbital excitations is subject to restrictions to be specified based on the physical situation at hand. The restrictions on the active space allow the theory to be evaluated under conditions where other wavefunction based methods, due to exponential scaling in the numerical efforts, cannot. The restrictions also allow us to clearly identify the excitations that are important for an accurate description, significantly beyond the mean-field approach. We first apply this theory to compute the ground-state energy of tens of trapped bosons, and second to simulate the dynamics following an instantaneous quenching of a non-contact interaction. The method provides accurate results and its computational cost is largely reduced compared with other wavefunction based many-body methods thanks to the restriction of the active orbital space. The important excitations are clearly identified and the method provides a new way to gain insight in correlation effects.

[1]This work was supported by the ERC-StG (Project No. 277767-TDMET) and the VKR center of excellence, QUSCOPE

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Date submitted: 03 Feb 2017 Electronic form version 1.4