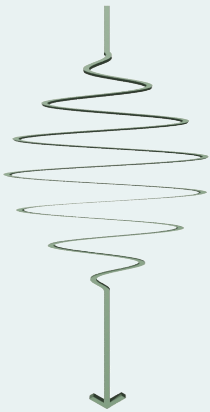


March 23rd, 2012 - 14:30 pm

Seminar Room 13, DESY Bldg. 222



Max Planck
Research
Department
for
Structural
Dynamics



SEMINAR

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Quasi-particle Theory of Strongly Correlated Lattice Bosons: Application to the Bose-Hubbard Model

We present a quasi-particle theory for strongly interacting lattice bosons, which, in contrast to Bogoliubov theory, is also valid for strong depletion of the condensate and in the Mott insulating phase. The derivation is based on the linearization of the equations of motion for a Gutzwiller variational state and a quantization of the classical amplitudes of the resultant excitations.

Within this theory of non-interacting quasi-particles, we calculate the single-particle spectral function of the single-band Bose-Hubbard model. In addition to the gapless Bogoliubov mode, we also clearly resolve the amplitude mode, which becomes particularly relevant in the strongly correlated regime, in the vicinity of the Superfluid-Mott transition.

Additionally, we set up a perturbation theory based on the ladder approximation for dilute Bosonic gases, to obtain the finite lifetime of the quasi-particles as well as the spectral broadening. This theory recovers the well known Beliaev-Popov perturbation theory for Bose condensed systems in the limit of weak interactions.



Host: Martin Eckstein, MPSD, CFEL