

Bose-Hubbard model in bosonic dynamical mean-field theory

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We investigate the Bose-Hubbard model within the recently developed bosonic dynamical mean field theory (B-DMFT). To clarify the difference between B-DMFT and the random phase approximation (RPA) we restrict our investigation by normal phases. To solve the single-site problem we use two analytic approaches that are compared. The first technique is based on the different-time decoupling of irreducible parts in the equation of motion approach. In the second approach the perturbation series expansion is used for single site Green's function with diagram technique. As a result of summing up the series the alloy-analogy approximation with higher corrections is obtained. The result is analyzed in the strong coupling limit. In this case, it is shown that for integer particle concentrations the alloy-analogy approximation gives the same criterium for appearing Bose-Einstein condensation as RPA.